nui sense

Evaluating Houseboat Residents' Perception of Vessel Traffic-generated Nuisance in Amsterdam

Nina te Groen
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P e r s o n a l . n o t e

In Amsterdam, houseboat residents suffer from nuisance caused by vessels, and raising awareness of this problem is needed. Having grown up on a houseboat in Amsterdam, I have always hoped to contribute to their way of living through design. I strongly believe that living on a houseboat is an amazing experience, and I hope it remains a part of Amsterdam's future.

Anyone who reads this project will get a glimpse into the life of houseboat residents, not only the luxury and enjoyment but also the dissatisfactions that currently exist due to vessel traffic.

This project aims to inspire scientific researchers and policymakers by highlighting the impact and importance of understanding the living experience of these residents.

I am proud of the insights gained through this project, and I cherish the conversations I had with the houseboat residents. Throughout this project, I met many kind houseboat residents who welcomed me into their homes. They shared their experiences of the nuisance caused by vessel traffic, which will be detailed in this report, along with photos of some of the participants.

This project is in interest of MIT SAL, a collaboration between MIT and AMS Institute. The location at MIT SAL was an inspiring community with international researchers, all of whom were a pleasure to work with. New friendships were definitely formed, and we even made music together.

Acknowledgements

Throughout this project I noticed the importance of my family for support and how much I enjoy meeting new people. I am proud to say that I enjoyed graduating, which was stimulated by the following people:

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For your enthusiasm, support and feedback throughout the entire design process. Your knowledge of qualitative research methods was very valuable.

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For providing new insights into conducting and communicating research professionally, as well as for your clear feedback, involvement, and interest in the project.

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For the trust in my project, providing a the team to work with, and your positive energy.

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Thank you for welcoming me into your homes, for your openness, and for sharing your stories.

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Thank you for being inspiring and helpful during the prototype development.

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Thibaud te Groen
For assisting with writing and offering a critical perspective on the results.

The AMS band
For making me laugh, making music, and performing together.

Glossary

Contextmapping
Involving users as 'experts of their experience' to get insights into the needs of the user (Sanders & Stappers, 2013).

Data on Nuisance
The data of the environmental conditions and houseboat residents' experiences that is gathered with the design 'nuiSENSE'.

Deductive Thematic Analysis
A form of analysis within qualitative research by developing patterns of themes (Braun & Clarke, 2022).

Path of Expression
A framework for guiding users in exploring their past, present, and future experiences (Sanders & Stappers, 2013).

Prototyping
Demonstrate and validate ideas by giving a physical instantiation of a phenomenon (Stappers et al., 2023).

Sensitizing booklet
Homework for individuals to reflect on their past and present experiences and future dream before discussing them in an interview.

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Introduction

1

Read this chapter to understand the purpose of this research and what you can expect from it.


Pluto
Pluto

Topic
Measuring Environmental Nuisance

1.1

Keywords: Environmental nuisance, environmental noise, perception of nuisance

A significant number of residents in Europe face unwanted environmental conditions, such as noise and air pollution. Research by the World Health Organization (WHO) shows that at least 20% of the urban population in all EU member states is exposed to levels of noise exceeding WHO recommendations. Environmental nuisance occurs when environmental conditions are perceived as negative, causing chronic, uncontrollable effects on individuals or communities (Campbell, 1983).

Environmental nuisance in urban areas have been extensively studied, particularly concerning physical stressors such as noise and pollution (Robin et al., 2007). The focus on noise nuisance began with the introduction of the Environmental Noise Directive in 2002, a EU law aimed at identifying noise pollution levels. All EU member states are required to prepare and publish noise maps and noise management action plans every five years for large cities. These maps offer a good overview of environmental nuisance and indicate where noise levels cause disturbances.
See Figure 1 for an example of the noise map of road traffic for Amsterdam.

However, while these maps include noise information caused by road, air traffic and industry activities, they do not provide details about noise produced by vessels in urban areas, even though vessels can be a significant source of environmental noise in cities rivers, docklands, or canals (Bernardini et al., 2019). Moreover, the indicators for the required noise maps do not account for the full perception of nuisance. The nuisance is estimated in connection to the level of sound. Scientific measurements, such as the exposure level of sound, are insufficient to evaluate the experience of nuisance. As Haggett (2012) states, "Noise is something that is 'experienced' rather than just 'heard.'".

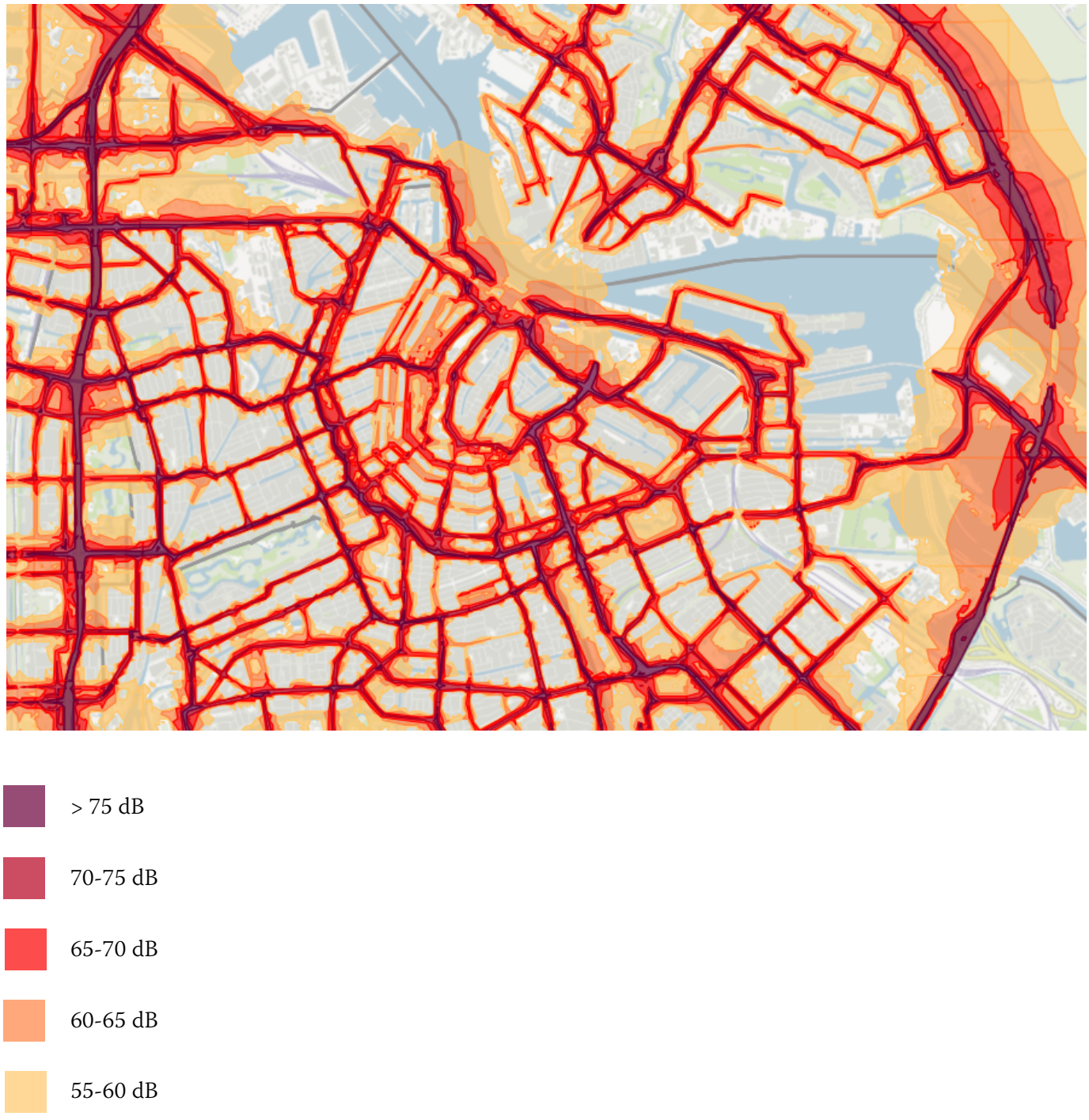
Measuring the full experience of environmental nuisance is challenging due to several factors. Individual sensitivity to environmental conditions varies, with research showing that individuals respond differently to both negative and positive experiences (Pluess et al., 2023). Secondly, the level of nuisance depends on contextual factors such as time and location; for example, a specific sound can cause severe nuisance at night but not during the day, as night-time noise can cause sleep disturbances (Muzet, 2007). Lastly, broader contextual factors such as the individual's attitude towards the source, resident satisfaction, and the way policymakers address the problem also influences the experience of nuisance (Haggett, 2012).
Therefore, new methodologies and ideas are needed to measure the experience of nuisance in large cities.

This research will focus on a specific case in Amsterdam, examining the experience of nuisance produced by vessels, including environmental noise. This case is interesting for this study since significant environmental nuisance is

experienced by houseboat residents in Amsterdam and more information of the residents' experiences is needed. The next section provides a detailed explanation of this case.

This case serves as an example of an approach to assess the experience of environmental nuisance to optimize the well-being of residents in urban areas, aiming to provide new information and tools for researchers and policymakers. It may also inspire others interested in the evaluation of environmental nuisance.

Figure 1. Noise map: Road traffic during the day in Amsterdam



Case Study

Houseboat residents in Amsterdam experience environmental nuisance due to vessel traffic

1.2

There are around 2,800 houseboats registered in the Amsterdam canals, each with its own address and utilities (Gemeente Amsterdam, 2020). These houseboats vary widely, from historic house-ships and vessels to modern concrete pontoons.

According to the Houseboat Association of Amsterdam (WVA), houseboat residents experience significant environmental nuisance due to vessel traffic in the city's canals. The stressors for the nuisance include noise from music, conversations, and engine sounds, as well as waves that cause the houseboats to rock.

Having lived on a houseboat in Amsterdam myself, I can confirm the peaceful and liberating experience of being surrounded by water and nature. However, many vessel passengers, and presumably also policymakers, do not realize the disturbances they cause for houseboat residents, which can disrupt this tranquillity.

The book *Overlast en Ondergrens* (translated as *Nuisance and Threshold*) by the Houseboats Coalition of Amsterdam addresses the ongoing nuisance experienced on the water. The book features interviews with houseboat residents who report that current methods of reporting nuisance to the municipality of Amsterdam do not lead to effective action or improvements in their well-being. The persistent nuisance, often caused by inexperienced boat drivers, mean that houseboat residents cannot enjoy their homes peacefully, especially in good weather (Overlast en Ondergrens, 2021).

'De Digitale Gracht' is a project started in 2019 by the municipality of Amsterdam to monitor the vessel traffic in Amsterdam by gathering data in the city. Each year, they publish the *Grachtenmonitor* which provides an overview of vessel traffic, nuisance reports, permits, and legal matters of the canals of Amsterdam.
The 2023 report shows that during the busiest ten days of the year, peak congestion occurs on the Prinsengracht, Herengracht, Oudezijds Voorburgwal, and on connecting canels such as the access routes to the Red Light District and the connection between the Brouwersgracht and the Singel (see figure 2).

While the report explains the state of traffic, it does not offer recommendations for addressing the issues, nor does it provide specific information on the experience of nuisance for houseboat residents.
Therefore, this context is used for studying and developing tools for measuring nuisance to optimize their well-being.

The results of this study could be applicable to similar contexts involving moving vessels and could inspire methods for evaluating other environmental nuisance for vulnerable communities. Furthermore, the findings could be useful for urban planning in Amsterdam, offering new insights into the experience of nuisance in the city.

Figure 2. Crowdedness on the busiest days (Grachtenmonitor, 2023)

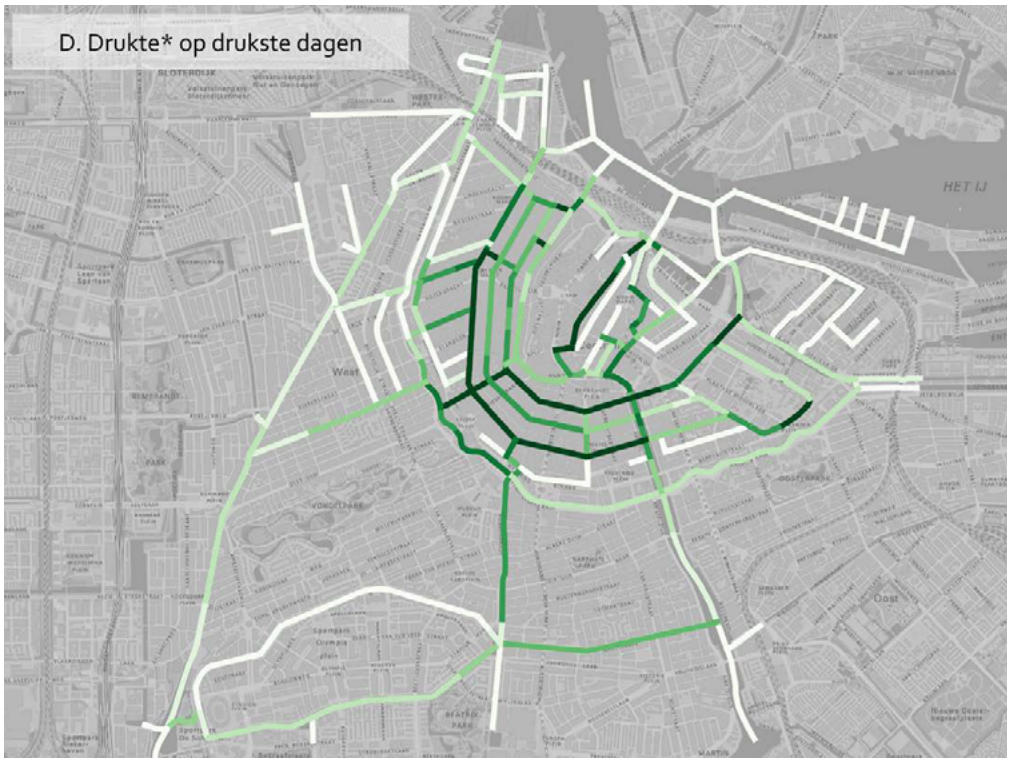


Figure 3. Houseboat in Amsterdam

Stakeholders

1.2.1

Figure 4 presents the stakeholders involved in the case, outlining their roles and the relationships between them. Houseboat residents are affected by the nuisance and report it to the municipality of Amsterdam, which responds by reviewing and addressing these reports. MIT SAL's role is to contribute to relationship between the municipality of Amsterdam and houseboat residents.

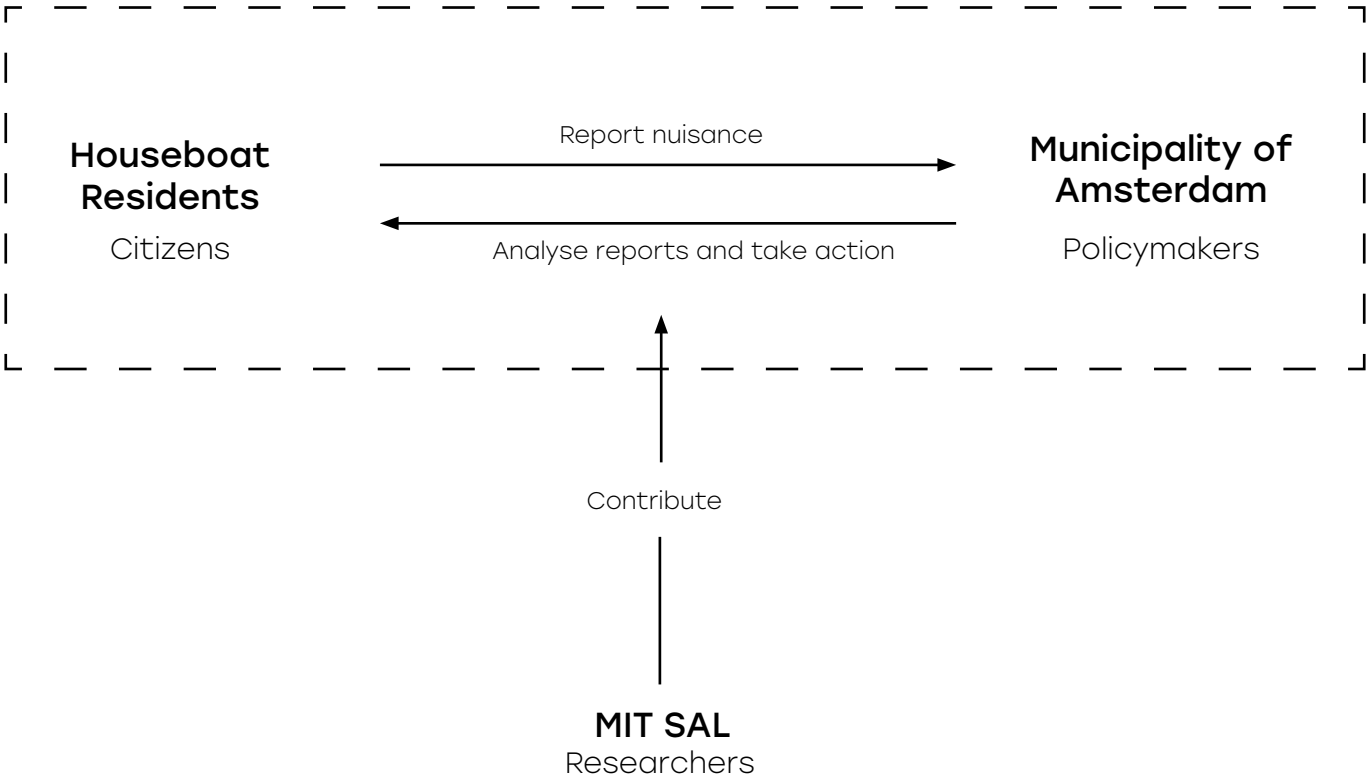
Municipality of Amsterdam
(*Policymakers)*
The municipality of Amsterdam address the reports of nuisance caused by vessel traffic, make and adjust policies and manage the enforcement.
The 'Nautical Management and advisory team' of the program of vessels within the municipality of Amsterdam is responsible for the navigation policy of vessels in the City of Amsterdam.
They have the legal duty to ensure smooth and safe navigation of various vessels on Amsterdam's waterways (Programma Varen, 2021).

Houseboat residents
(*Citizens)*
The houseboat residents experience the nuisance due to vessel traffic and currently report this to the municipality via an app, website or by calling.
The experience of the houseboat residents play a central role in this project. Therefore, it is necessary to involve the houseboat residents when identifying the context and solution space of this research.

MIT SAL
(Researchers)
This project is done in interest of MIT Senseable Amsterdam Lab (SAL), a collaboration between MIT and AMS Institute.
MIT SAL is part of the MIT senseable city lab, a research initiative at the Massachusetts Institute of Technology working in Amsterdam, Stockholm, Emilia-Romagna and Rio de Janeiro. It's vision is to gain new insights of the built environment of large cities by using and developing new tools.

The researchers of MIT SAL have different disciplines (biologists, designers, engineers, social scientists etc.) and work together to analyse and gather urban data of Amsterdam.
Their role within this graduation project is to support evaluating houseboat residents in their conversation with policymakers with a new developed tool.
Once a week a research sprint takes place in which the researchers, including me, show their research and receive feedback.

Figure 4. Stakeholders



Research Questions

1.2.2

The research addresses the following
main research question:

How can we evaluate houseboat residents' perception of nuisance caused by vessel traffic in Amsterdam?

This question will be addressed by the following sub-questions:

Q1:
What methodologies have been employed in the measurement of environmental nuisance up to now?

Q2:
How do houseboat residents experience nuisance caused by vessel traffic?

Q3:
How can a tool evaluate houseboat residents' perception of nuisance caused by vessel traffic?

Literature Review

2

This chapter describes three literature reviews that explore approaches for measuring environmental nuisance. The chapter ends with a conclusion summarizing the insights gained from the literature.


S P A

Related Research

2.1

This chapter shows totally different research projects to assess nuisance in the environment.

The first project is about measuring noise specifically of vessel traffic in canal cities. The second is looking more broadly at measuring the perception of the liveability in cities in the Netherlands. The third gives an example of using a cheap sensor tool to start a dialogue between those involved in the context of the problem.

Noise Assessment of Small Vessels for Action Planning in Canal Cities

2.1.1

According to the WHO, it is important that policymakers and scientific researchers study environmental noise to eventually avoid, prevent or reduce the negative effects. Environmental noise is one of the main environmental risk issues to physical and mental health and well-being (Fritschi et al., 2011).

According to the EEA, The European Environment Agency, environmental noise is unwanted sound created by human activities such as road or air traffic. Prolonged exposure to environmental noise increases the risk of sleep disorders, noise annoyance, lack of concentration, and auditory fatigue (Muzet, 2007).
Bernardini et al. (2019) addresses the relatively under-researched acoustic characteristics of vessel traffic in canal cities.
This study is relevant to this project as it demonstrates the implementation of noise assessment specifically for vessel traffic in cities like Amsterdam.
The research monitored noise from small vessels in the canals of Livorno's city centre using microphones and cameras, estimating citizens' noise exposure. Noise measurements were taken with a microphone equipped with a 90 mm windscreen, placed away from obstacles. The types of vessels passing by were documented through photographs.

The study categorized vessels based on their acoustic characteristics. Category 1 (Cat1) includes small motorboats, sailing boats, and rigid-hulled inflatable boats, while Category 2 (Cat2) encompasses small to mid-sized fishing boats, fire-boats, and public security boats.
This categorization was based on measurements of LAeq, time of measurement, passage duration, vessel type (identified through photographs), and noise spectra. Vessel speed was measured but was not used in the categorization.

The noise contour map in figure 6 illustrates the estimated noise exposure in Livorno due to vessel traffic based on the sound measurements.
This map was created using the Facade Noise Map, a tool from SoundPlan that facilitates quick noise simulations (SoundPlan Asia Co., Ltd., 2020).

The study also examined the annoyance of residents based on the dose–effect relationship developed by Guski et al. for road traffic noise (Guski et al., 2017). The results indicate that the current situation does not raise significant concerns, but changes in speed, traffic flow, or proximity to residential areas could likely lead to increased complaints from citizens.

The findings provide a method for measuring vessel characteristics. This research applies a methodology similar to that used for other traffic noise assessments, highlighting a field that has been relatively neglected.
However, while the study connects noise to the experience of annoyance, it lacks information on the broader nuisance caused by the exposed noise.

Figure 1. Satellite map of the area and localization of the measurement positions.

Figure 5. Measurement positions of the noise assessment in Livorno.

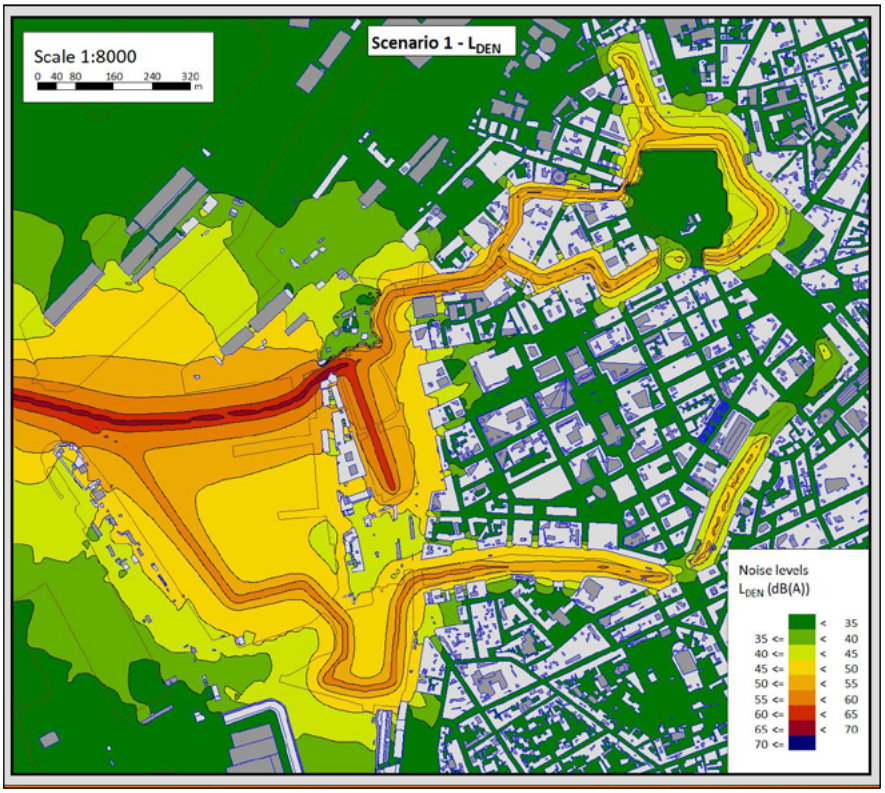


Figure 6. Noise contour map of Livorno

A Questionnaire for Measuring Liveability

2.1.2

Van Overveld et al. (2009) explains the development process and implementation of a questionnaire designed to measure how residents perceive their living environment.

The questionnaire was created for the Municipal Public Health Service (GGD) workers in the Netherlands to inform municipal policies aimed at improving the quality of life for residents.

It is a questionnaire intended to create a database of residents' experiences with their living environment. The questionnaire is seven pages long and includes questions about environmental problems they face, such as dog poop, nuisance from smell or sounds, as well as their feelings of safety, health, and the presence of greenery.

The report explains that residents' perceptions may not always align with objective environmental data. For instance, people might feel satisfied even though the measured noise exposure is above the recommended levels.

Standard questions from the 'outdoor environment' and 'living environment' modules in the Local and National Public Health Monitor were integrated into the questionnaire. The 'outdoor environment' module consists of questions about environmental nuisance like noise pollution and air pollution, as well as satisfaction with green spaces in the neighbourhood. The 'living environment' module includes questions about general satisfaction and perceived safety in the living environment.

These modules were chosen because the questions have already been proven to yield valuable data, and they are highly relevant to municipal policies, because they are aligned with broader public health standards which makes the data comparable with other regions.

An interesting aspect of the questionnaire's implementation is that the report also provides guidelines on how it should be used by GGD service workers, making the questionnaire immediately applicable for these professionals.

However, the questionnaire appears lengthy, which may discourage residents from completing it. Additionally, the questions are too broad for measuring the perception of nuisance caused by vessels, as it is already focused on a specific cause of nuisance.

For this project, the survey is relevant in terms of how the questions are formulated and which aspects of the living environment are measured and how.
To measure the nuisance they use a scale from 0-100. A score above 72 is seen as severely annoyed, 50 as annoyed and 28 as somewhat annoyed.
This is used, because it is an internationally used method for assessing nuisance (Eam et al., 2004).

Amsterdam Sounds

2.1.3

Amsterdam Sounds is a noise monitoring project with the goal to start a dialogue between policymakers and citizens (Zuurmond, 2021).
It is a collaboration started in 2019 of Gemeente Amsterdam, Ombudsman Metropool Amsterdam, Sensing Clues and Waag.
For around 1,5 years they have been measuring the sound environment in the wallen in Amsterdam with an open source sensor technology.

This project was done during COVID-19 and they measured the environmental sounds before, during and after the lockdown. The results show that the noise levels, especially during night-time, dropped in comparison to pre-lockdown levels. Figure 7 and 8 presents two graphs with information of noise levels before and after the opening of the terraces. There is an increase of noise levels, especially during the night. These results show that the effect of policies can have direct influence on the level of noise.

The design that they have created themselves for this project is called the Amsterdam Sounds Kit. The idea behind it is that citizens can make the sensor themselves with the provided guidelines.
The parts, the code and the housing of the design are all explained on this website: *https://amsterdamsounds.waag.org/hoe-bouw-je-een-open-source-geluidsmeter-voor-het-internet-of-things/.*

The sensor that they used has been reported as the best of the seven sound sensors for measuring reliable sound characteristics by the RIVM, the National Institute for Public Health and the Environment in the Netherlands.
They confirmed that the self-made sound sensor can be a valuable tool to measure ambient noise for both citizens as local authorities.

This project is inspiring mostly because of the intention of using a sound sensor for starting a dialogue and including the stakeholders in the process. But also the way the sensor gives the opportunity to use cheap sensors for the reflection on the ambiance of sound.

However, the sounds don't give any information of how the sounds are perceived by the citizens. There is proof for the increase of the level of sound, but there is information missing on the experience of that level of sound.

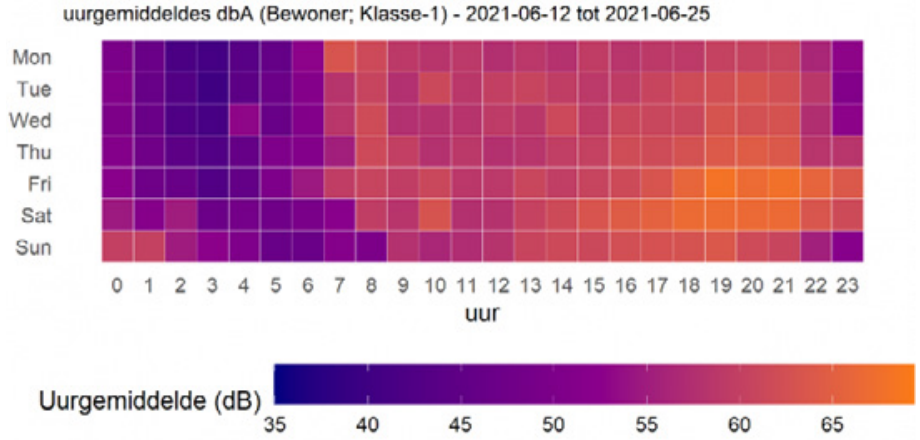


Figure 7. Measurements two weeks before the opening of the terraces

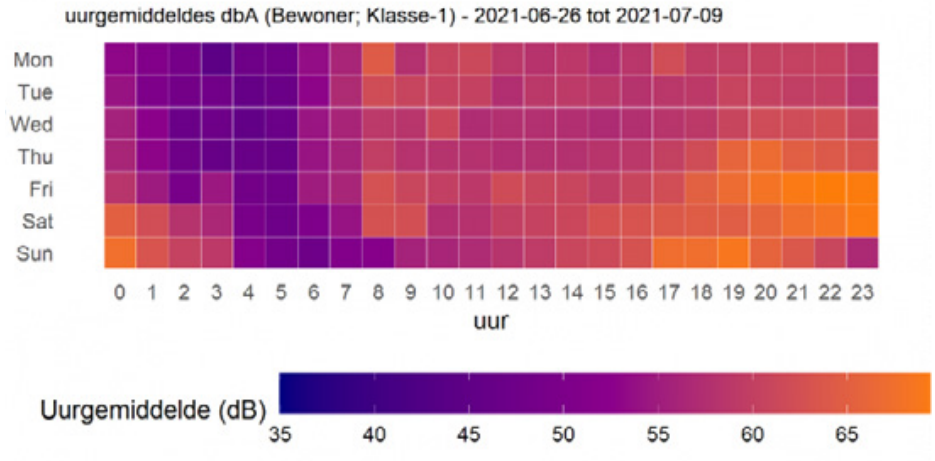


Figure 8. Measurements two weeks after the opening of the terraces

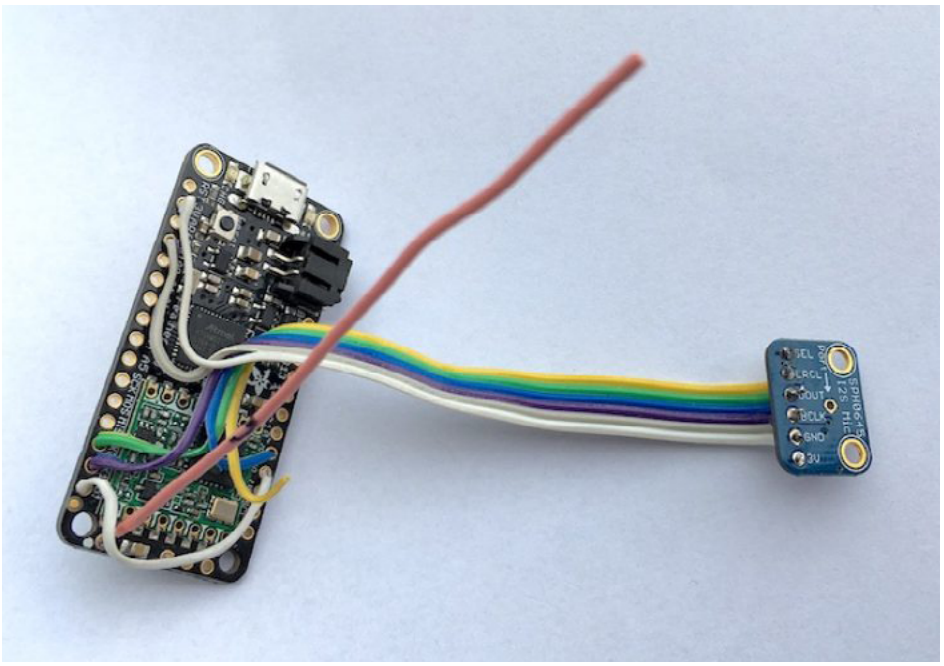


Figure 9. The hardware of the sensor

Figure 10. Measurement positions of the sound sensor

Conclusion

2.2

The three projects demonstrate methodologies that have already been applied to evaluate environmental nuisance.
The insights will be used to develop design requirements for this research project.

The learning points from project 1:

- The causes on the well-being of residents by vessel traffic is under-researched
- There is little research on the noise produced by vessel traffic
- Vessels can be categorised based on their sound emissions and photographs
- The effect of nuisance is only measured by a simulation tool which estimates the exposed sounds

The learning points from project 2:

- The level of annoyance is internationally measured by a scale from 0-10
- There are existing modules that are broadly used by different governments to assess the liveability of residents
- A guideline on the use of the liveability assessment survey is necessary for an implementation

The learning points from project 3:

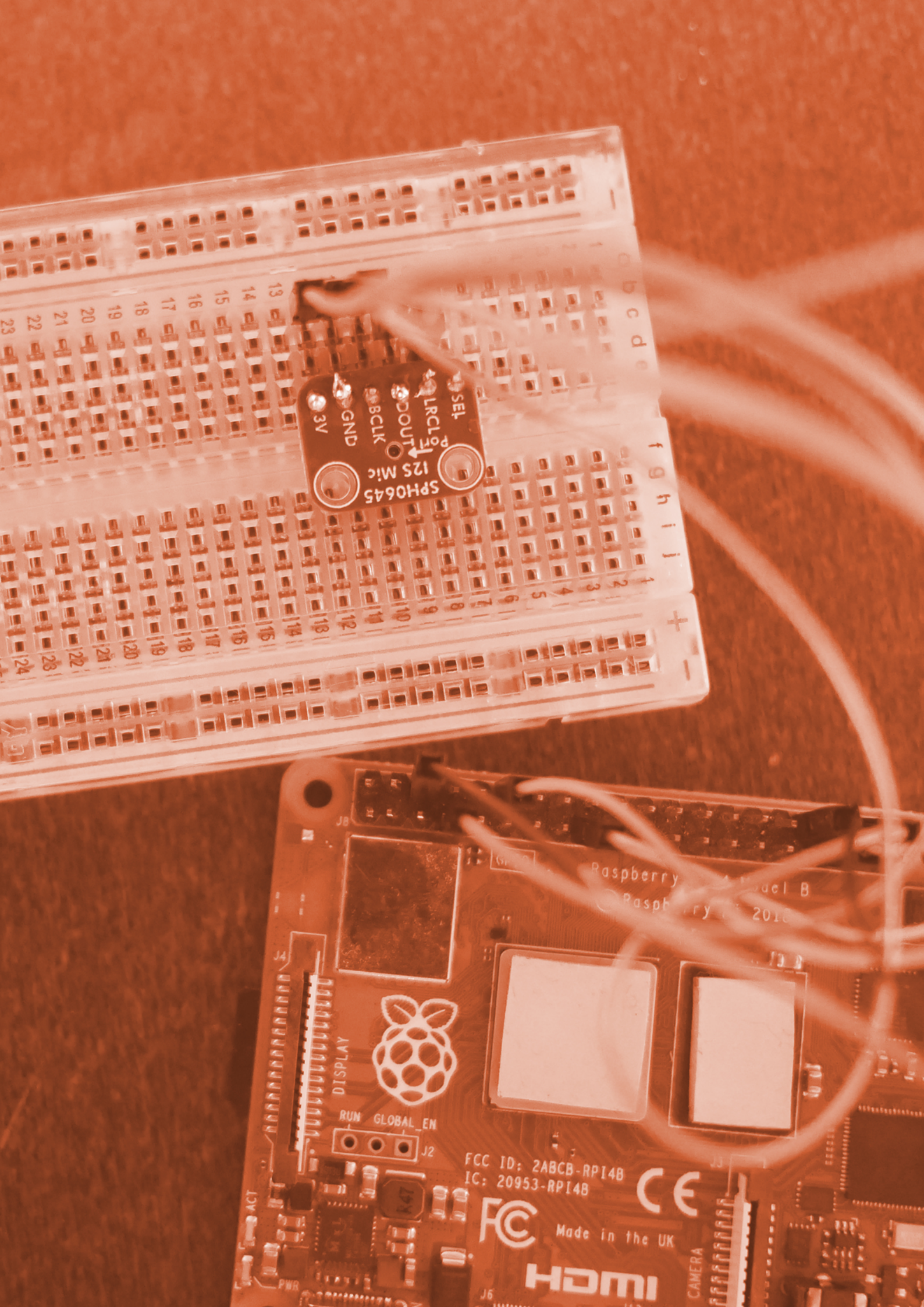
- Cheap sound sensors can be used to measure the ambiance of sound
- Measuring environmental nuisance is effective for starting a dialogue between stakeholders
- Decisions made by policymakers can have direct influence on the exposure of sound for residents

To conclude, there is limited research on the emissions from vessel traffic in urban areas, and measuring environmental nuisance is effective for initiating a dialogue among stakeholders. Therefore, assessing the environmental impact of vessel traffic is valuable for future research. Bernardini et al. (2019) demonstrate that vessels can be categorized based on their sound characteristics.
However, focusing solely on the environmental conditions caused by vessel traffic does not fully capture residents' experiences. Van Overveld et al. (2009) provide an example of how to measure residents' experiences. Their research indicates that annoyance should be measured on a scale from 0 to 10 and suggests that questionnaires can be useful for gathering information about experiences. However, specific questions should be included, and the questionnaire should not be too lengthy to complete for this research.

Methods

3

This chapter explains all the methods used in this research. It begins by describing each method and the questions they aim to answer. The reasoning behind and details of each method are provided, including information on how they were implemented and developed.


3V
GND
BCLK
DOUT
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SEL
SPH0645
I2S Mic
FCC ID: 2ABCB-RPI4B
IC: 20953-RPI4B
Made in the UK
HDMI
DISPLAY
CAMERA
RUN
GLOBAL_EN

Method Selection

3.1

Table 1 presents the questions introduced in Chapter 1, along with the corresponding methods used to address each one. Additionally, all methods employed in this research are explained in 'Index Methods', including their definitions and the sections in which they are discussed.

INDEX METHODS

3.2 Contextmapping
Involving users as 'experts of their experience' to get insights into the needs of the user (Sanders & Stappers, 2013).

3.3 Deductive Thematic Analysis
A form of analysis within qualitative research by developing patterns of themes (Braun & Clarke, 2022).

3.4 From Results to Design Requirements
The approach to bring the results of the previous methods into requirements for the design.

3.5 Prototyping
Demonstrate and validate ideas by giving a physical instantiation of a phenomenon (Stappers et al., 2023).

3.6 Three-Day Prototype Test
The test of the first model of the design 'nuiSENSE' with four houseboat residents.

3.7 Interview Evaluation
A conversation about the usability of the design with houseboat residents after the 'Three-Day Prototype Test'.

Question	**Method to answer question**
What methodologies have been employed in the measurement of environmental nuisance up to now?	• Literature review
How do houseboat residents experience nuisance caused by vessel traffic?	• Contextmapping • Deductive Thematic Analysis
How can a tool evaluate houseboat residents' perception of nuisance caused by vessel traffic?	• Prototyping • Literature Review • From Themes to Design Requirements • Three-Day Prototype Test • Interview Evaluation

Table 1. Methods used for addressing research questions

Contextmapping

3.2

Context mapping was used to answer the following question:

How do houseboat residents experience nuisance caused by vessel traffic?

The experience of nuisance is very personal, and it depends on many different indicators (Haggett, 2012). To involve the residents in this research, help them explain their experience, and ensure the future fit of the design in the context, contextmapping was used.

Contextmapping is a method to identify the deeper meaning of the needs and values of the user through generative techniques (Sanders & Stappers, 2012). Generative techniques help explore the deeper level of the needs and values of users by directly involving the users in the design process and by giving them a language to express their ideas and dreams (see figure 11). This method is mostly used to inform design teams of the needs of the users to ensure a good fit for a future product or service. The user might not be aware of her/his needs (latent needs) or find it difficult to express them (tacit needs), so this method helps the user find them by chronologically delving into the past, present, and future. Thinking of moments in the past and present will help users find their wishes for the future. This is called the path of expression (see figure 12), which illustrates that the present, the 'now,' is influenced by both memories and future dreams.

Part of the method, interviews were planned with eight houseboat residents to talk about their nuisance.
As the nuisance for the houseboat residents can be caused by different contextual factors, it can be a complex topic for them to talk about during an interview.

They need to be involved in the problem or situation for some time to be able to give insights into their experience.
Therefore, it is recommended to let them reflect on their experience two weeks in advance of a session about their experience. This was done with a sensitizing booklet, which is homework for the houseboat resident to analyse and describe their experience of nuisance, which the houseboat resident received to fill in. This booklet prepared them for the planned interview, which helped guide the conversation in the desired direction.

In practice, this method consists of three phases in the research:

1. Finding participants
2. Sensitizing the participants
3. Conducting the interviews

This chapter will elaborate on the reasoning and details of the steps taken in the three phases.

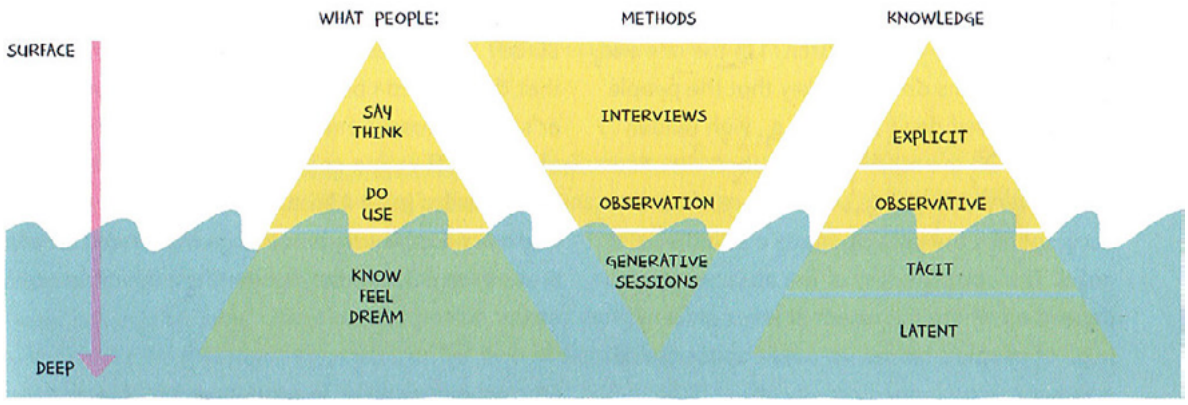


Figure 11. Design methods depending on knowledge level (Sanders & Stappers 2012)

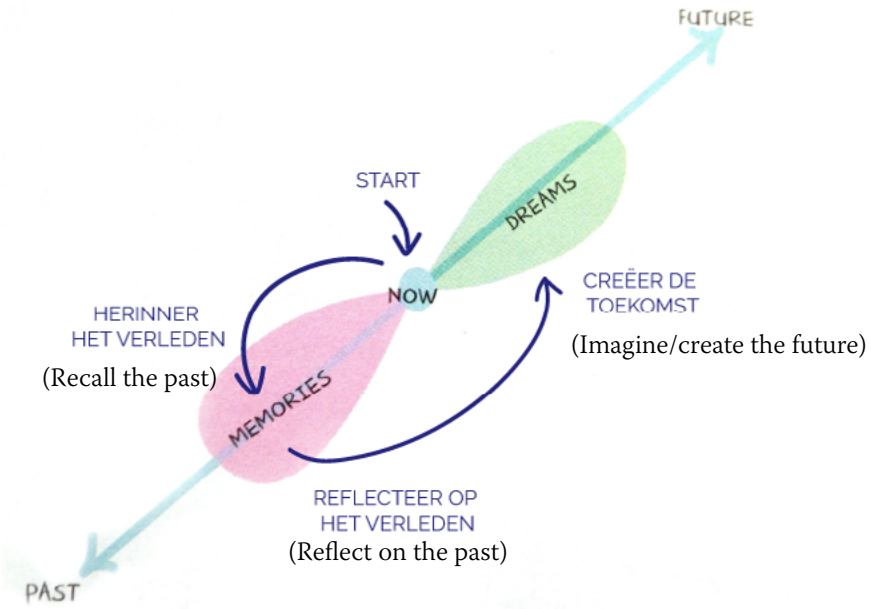


Figure 12. The path of expression (Sanders & Stappers 2012)

Finding Participants

3.2.1

Amount	**50 flyers**
Where	**The orange areas**

The participants for this research needed to be:

- Citizens of Amsterdam that live in a houseboat
- Experience nuisance caused by vessel traffic or swimmers
- Differ in urban area

I got the advice from WVA, the Houseboat Association of Amsterdam, to not only include boat traffic as nuisance factor, but also swimmers, because they got a lot of complaints from houseboat residents who were living next to a riser where people were swimming. Eventually, this research only focused on the effects of boat traffic, because both factors were too much to research.

To find participants, I cycled through Amsterdam on a sunny day and observed the diversity of the houseboats.
Then, I handed out flyers at the houseboats on the canals shown in figure 13.
These were the canals that I assumed were experiencing nuisance.
I wanted the participants to be spread through Amsterdam and therefore I chose different canals in different regions in Amsterdam to give flyers to.

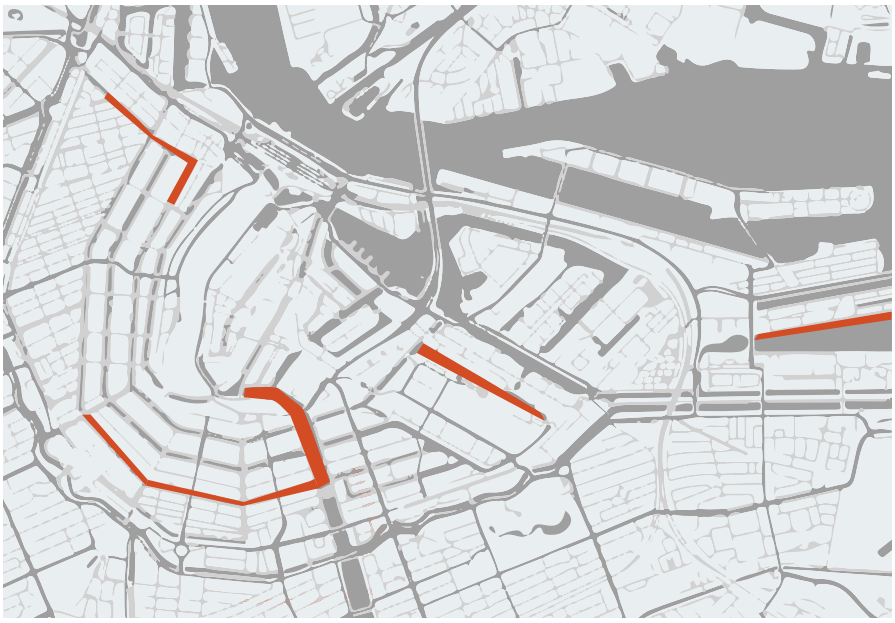


Figure 13. Areas of flyering

The flyer
To make the flyer inviting for participating in the research it included a QR-code. This code links to a Google form in which they can make an appointment with me for an interview (See figure 14).

Figure 14. The flyer

The Sensitizing Booklet

3.2.2

Amount	**8**
Participants	**Houseboat residents**
Size	**A4, 9 pages (double sided)**
Material	**colour paper print**

The interviewees were asked to fill in a sensitizing booklet to encourage them to think of the topics before asking about it during the interview.
Therefore the interview was conducted more effectively. Besides, the booklet was a good way for me to find out what I wanted to know about their experience.

The sensitizing booklet consists of three themes:

- **Their experience of living on a houseboat.** This gave a bigger picture of the target group and helped them to feel comfortable in filling out the booklet.
- **Their experience of nuisance**. What caused the nuisance and when did it occur? But also: How does it make them feel? And what do they want different for the future?
  These questions helped them describe their experience of nuisance for the interview.
- **Their view on citizen science.** Do they see value in using technology for empowering them? And how do they envision this?
  Their answers regarding this theme gave more insights into their opinion on their role in the design.

Figure 15 and 16 presents the sensitizing booklet. See Appendix A.1 for the content of the sensitizing booklet.

Figure 15. Sensitizing booklet front page

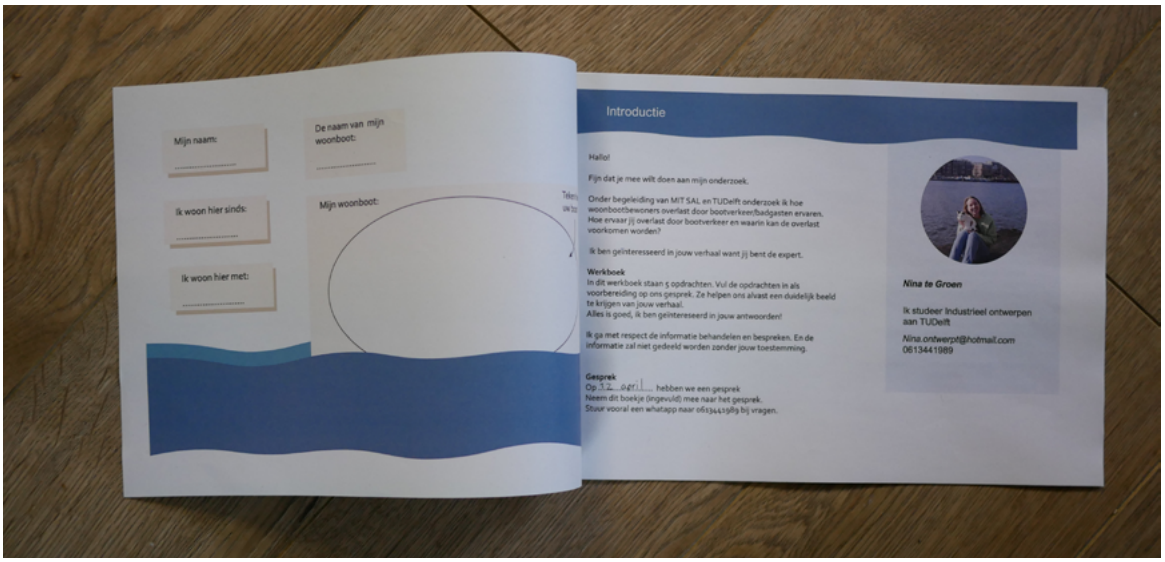


Figure 16. Sensitizing booklet first two pages

Conducting the Interviews

3.2.3

Amount	**8**
Location	**Participant's homes**
Duration	**30-60 minutes**

Interviews were conducted with eight houseboat residents shown in figure 17.
The interviews were recorded with approval of the participants.

The interview consisted of:
1. An explanation of the consent form, the goal and set-up of the interview and allowing participants to state their preferences
2. Questions regarding their experience of nuisance
3. Questions regarding the current and ideal ways of reporting nuisance
4. Questions about their view on citizen science

See Appendix A.2 for the interview questions and Appendix A.3 for the consent form for the interviews.

Figure 17.
Locations of the 8 houseboats of the participants of the interviews

Deductive Thematic Analysis

3.3

Thematic analysis is a method for analysing qualitative research to find patterns in complex and diverse data.

This method is chosen for this research because it provides the opportunity to systematically analyse the richness of information about a complex topic.
Eight houseboat residents gave information during the interviews that are altogether complex and diverse.

Thematic analysis, as described by Braun and Clarke, can be approached in different ways for different uses. Themes can be created while looking directly at the data (inductive), but it can also be used starting with pre-existing themes or codes (deductive). To save time and quickly organize the wide range of information, the research starts with pre-made codes.
The content and the reasoning of the pre-made codes are shown in step 2 of this method 'Structural Coding'.

The outcomes of the interviews were analysed by Deductive Thematic Analysis in the following order:

1. **Familiarization:**
   This part ensures that the analyser has a connection with the data by transcribing the necessary parts of the interview. All the interviews were automatically transcribed by Whisper, an automatic speech recognition system. These transcriptions have been adjusted by listening to the recording and reading the transcript at the same time.

2. **Structural Coding**
   For this part the highlights of the transcribed interviews need to be given a 'code', which describes the content. In order to ensure that all aspects of the experience of nuisance are mapped out, the pre-made codes were created based on the 5W1H (Who, Where, What, When, Why and How) method. This is an approach for exploring the underlying causes of problems with a structured framework (Heijne & Van der Meer, 2019). The 'where' of the 5W1H method will not be used for coding, because the location of the houseboats residents are already known.

   These are the pre-made codes:
   - **The direct cause of nuisance** (What)
   - **The person/object causing the nuisance** (Who)
   - **The time of the nuisance** (When)
   - **The barriers to solving the nuisance problem** (Why)
   - **The behaviour of the houseboat resident on the nuisance** (How)

Quotes in the transcriptions of the interviews that fit in one of the pre-made codes are copied and put into Miro, an online workspace. Miro gives the opportunity to copy information and make adjustments while saving other versions.
Each participant was assigned their own colour, so it was still known who said what (See figure 18).
The pre-made codes with their quotes are set apart and similar quotes are clustered and given

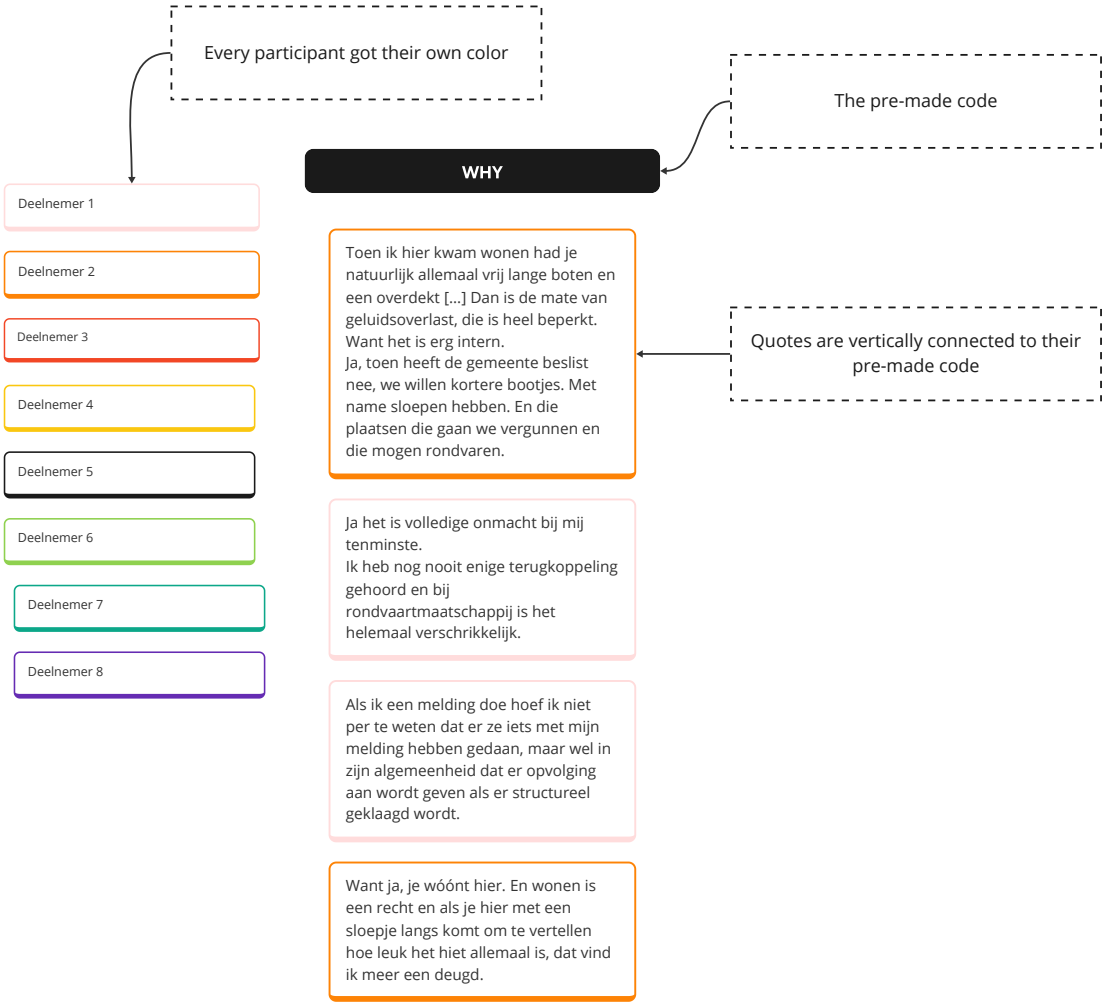


Figure 18.
The quotes regarding the pre-made code 'why': 'The barriers to solving the nuisance problem.

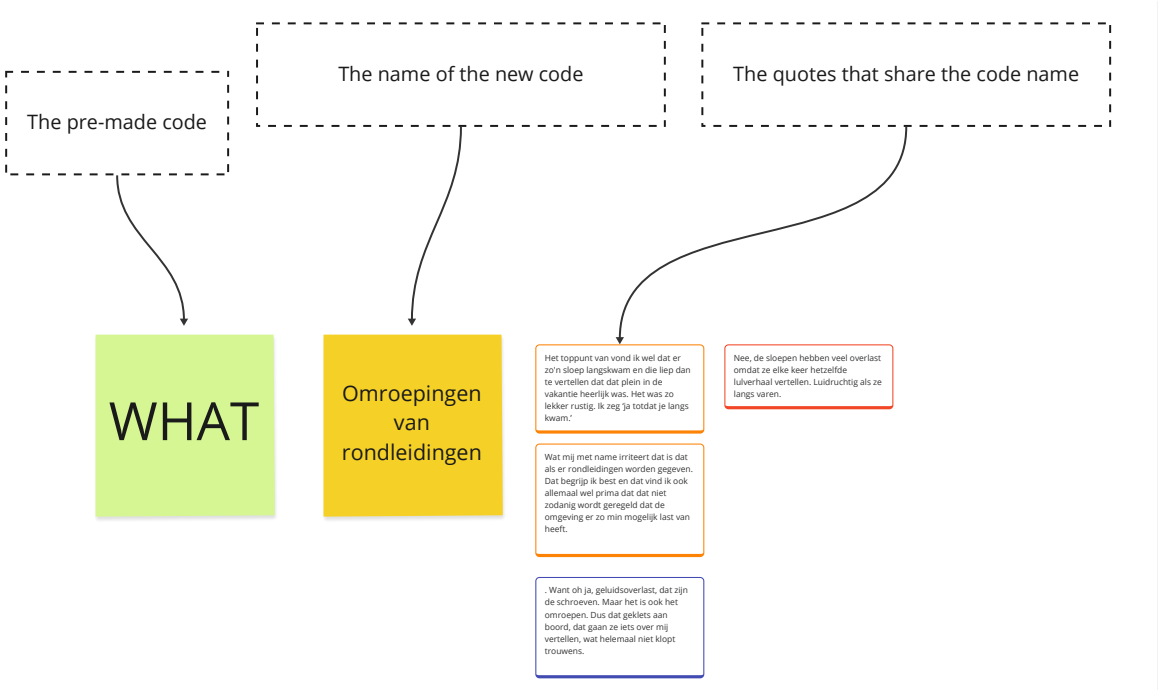


Figure 19.
The creation of new codes within the pre-made codes

a new code name as shown in figure 19.
Appendix B.1 shows the pre-made codes including their fitting new codes.

3. Generating themes

When there is a pattern in the codes, combinations of codes can be made which form a broader theme. The new codes form a theme with its own story, with a total of four themes. Figure 20 shows the first theme including the quotes with their codes.

4. Reviewing themes

Codes and themes that feel unuseful have been excluded, and the themes are changed, because new combinations of codes have been made after reviewing the themes.

5. Defining and naming themes

By presenting the outcome of the themes during the midterm presentation of this project, I could reflect on the feedback that I got from this.
The themes had to describe the full meaning and therefore some adjustments of the sentences describing the themes were made.

6. Describing and visualising

For each theme a visualisation was drawn in Adobe Photoshop that explains the meaning of the theme. Creating these visualisation helped finding the core message of the theme and communicates it to those who are interested.
Quotes of the participants were shown in the themes that supports the theme's message.

See Section 4.3 for the description of the four themes.
Appendix B.2 shows the clusters of codes for the four themes created in Miro.

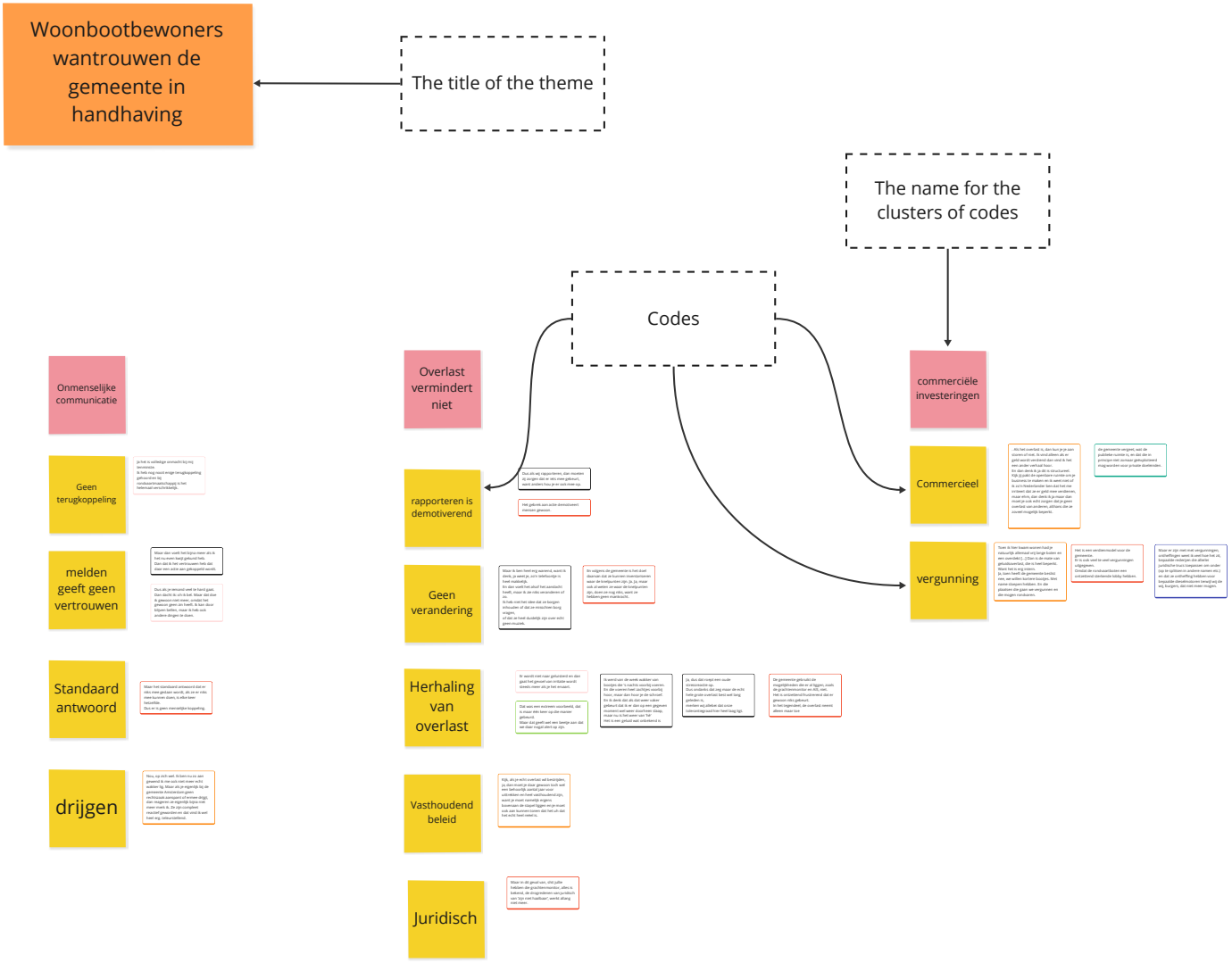


Figure 20.
The combination of codes that form the first theme

From Results to Design Requirements

3.4

The four themes of the Deductive Thematic Analysis were divided into two parts of the design:

1. **Data on Nuisance**
   The data that is gathered by the design should reflect the experiences of nuisance among houseboat residents.

   Target group:
   researchers and policymakers

2. **Houseboat residents' Needs**
   Houseboat residents need a way to report nuisance that aligns with their needs, ensuring the design functions effectively in its context.

   Target group:
   houseboat residents

Design requirements were intuitively developed by connecting the two parts of design with the outcomes of the thematic analysis.
For instance, the Deductive Thematic Analysis revealed that houseboat residents often feel powerless when experiencing nuisance. This insight was translated into design requirements for part 2, aiming to empower the houseboat residents.
The findings presented in the chapter titled 'Context' leaded to defining these requirements. The stories of the houseboat residents are the primary outcomes of this research and serve as the foundation for the design.

See Chapter 5 for the design requirements.

Prototyping

3.5

In this research, design requirements are created based on the outcomes of the Deductive Thematic Analysis. The method of prototyping is chosen as a follow up, because the ideas for fulfilling those requirements should be tested with the houseboat residents in order to make a design that works in the context.
Prototypes are physical or digital craftworks with the aim to demonstrate, test, and validate ideas. It is a well known and important method in the design world. Stappers states in his report about using prototypes and frameworks for designing: **"Prototypes are crucial in the design process as they allow designers to test and validate ideas in practice, ensuring that concepts are grounded in real-world usability and effectiveness."** (Stappers et al., 2023)

Creating the prototype surprises the maker with new details of the idea because it has to 'work'. Decisions need to be made on the details of the idea to make it a working prototype. The design requirements, therefore, become more specific.
However, the focus should not only lie in the making of the prototype; the important effect of prototyping is confronting the user with it. The reaction of the user is crucial for the validation of the design (Stappers et al., 2012).

An initial concept was developed visualized in Chapter 6. To test and validate this concept in context, a prototype was created consisting of three parts:

1. Survey
2. Nuisance Reporter
3. Visualization of nuisance data

The making of the three parts of the prototype are presented in the following sections.
Chapter 6 shows the created prototype as being part of the design.

Survey

3.5.1

Section 2.1.2 shows that the implementation of a questionnaire can measure how residents perceive their living environment. A survey is designed to capture the houseboat residents' experience of nuisance.
The design requirements presented in chapter 5 show that the survey should ask question about the experience of nuisance and eventually give an evaluation of the full experience of nuisance. The survey should be easy to access and give the information of nuisance per person.

An online form gave the possibility to let the participants report nuisance, but also the data on nuisance would be able to access afterwards for free.
Figure 21 shows how I could see the individual surveys in Microsoft forms.
Before using the survey for the test, It was tested with family members and friends to see if the questions are well understood.

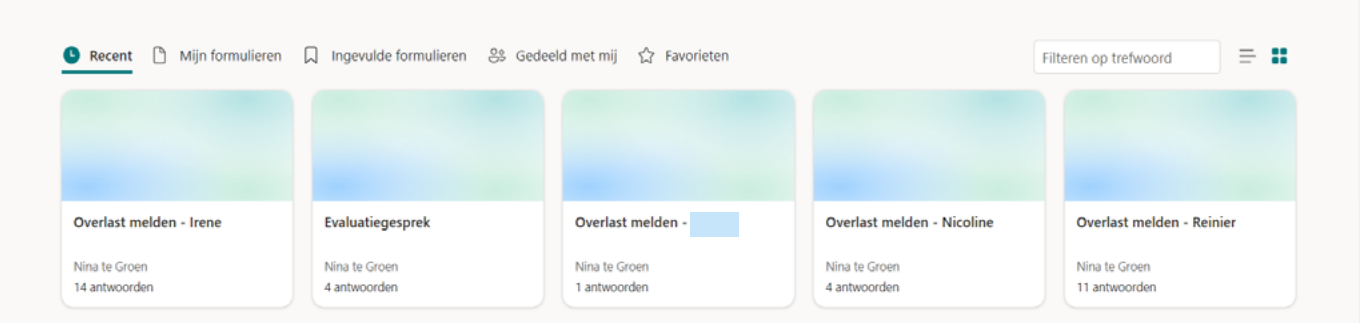


Figure 21. Surveys in Microsoft forms

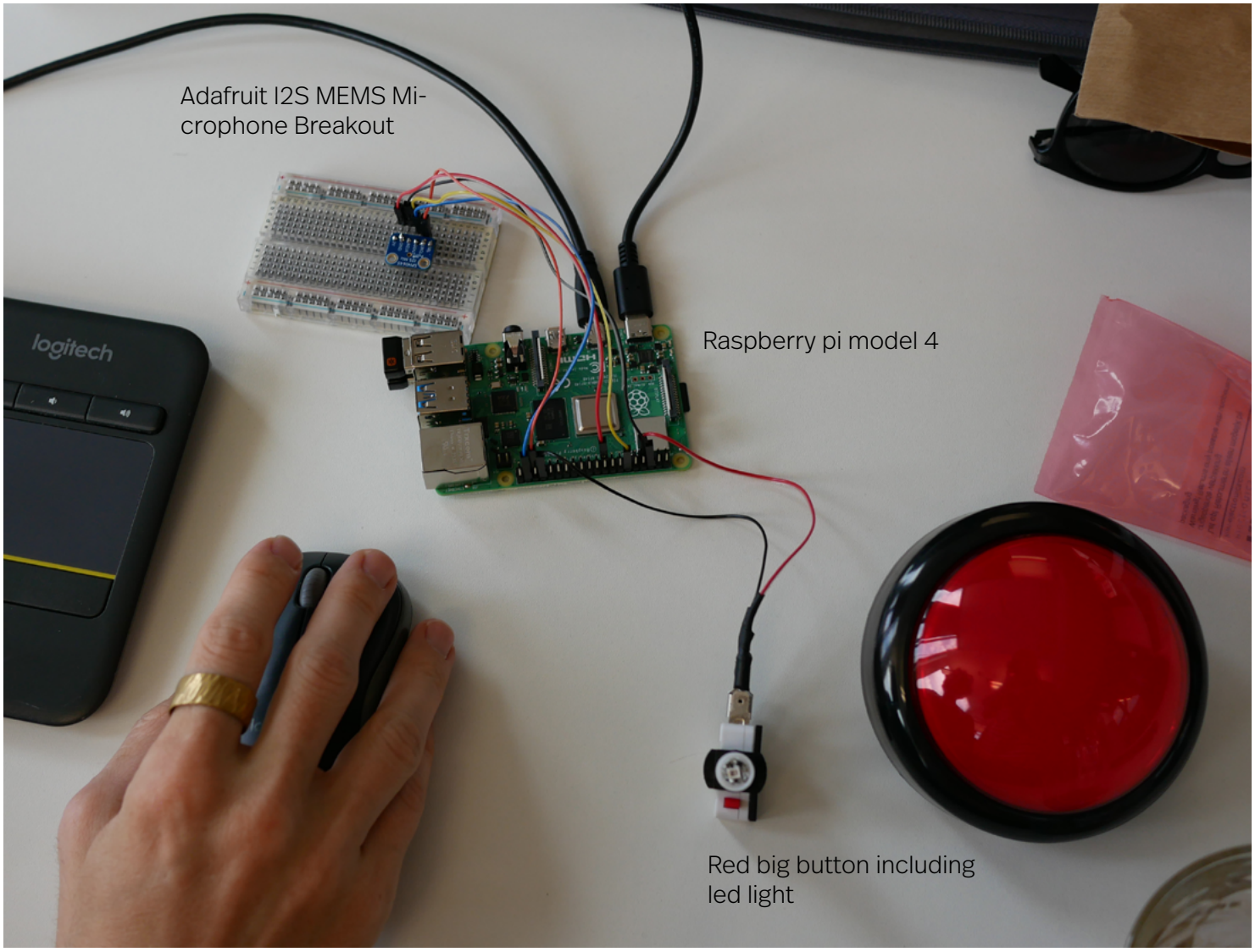


Figure 22. The components of the nuisance reporting box

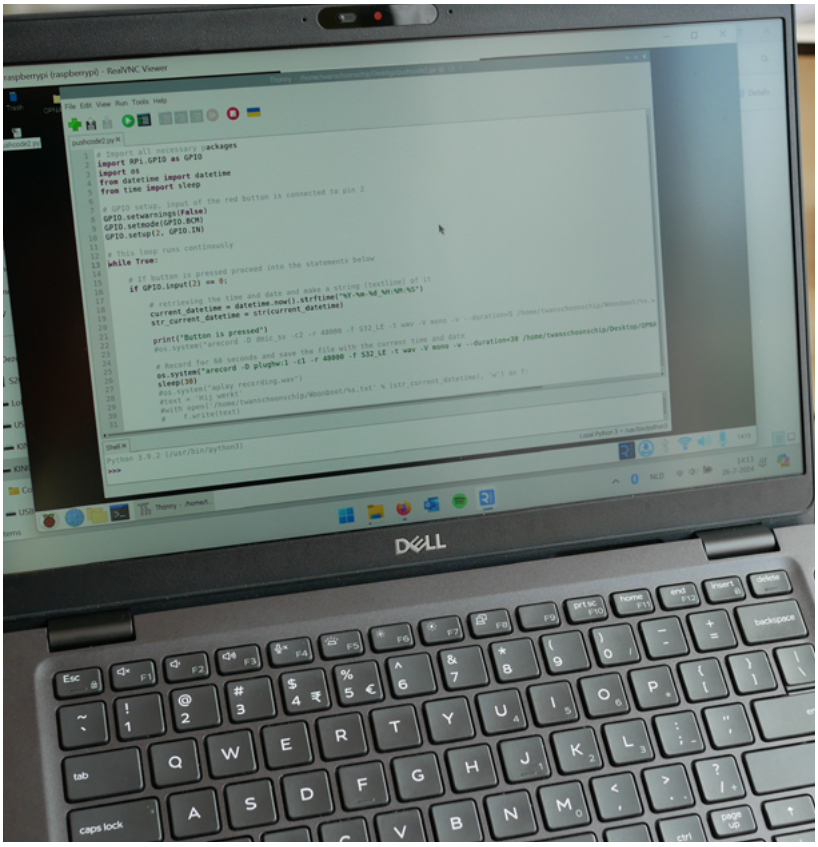


Figure 23. Writing the code

Figure 24. Twan Huijzer

Nuisance Reporter

3.5.2

The idea that is prototyped is a button that measures the exposed noise when it is being pressed (See Chapter 6).
The making of the prototype started with finding suitable hardware to record sound whenever a button is pressed. These part components needed to be ordered to make the prototype work:

Hardware
- The sound sensor:
  Adafruit I2S MEMS Microphone Breakout - SPH0645LM4H
- Mini computer
  Raspberry pi
- Button
  Big Arcade Button with LED - 100mm - Red
- Cables to connect the components
  Jumper wires M/M, F/M, F/F

Software
A code that leads the recording of sound. See Appendix C.

The physical design
- Housing
- Description: handbook
- Link to survey

1. Ordering components
The sound sensor needed to be affordable and easy to implement. Initially, the idea was to use an external sound sensor, but after reconsideration, it was decided that an internal sensor would better capture the noise experienced inside the houseboat. This choice simplified the requirement, as the sensor did not need to be waterproof.

The quality of the sound recording was crucial; the sensor needed to connect with the mini computer effectively.
Initially, Arduino components were considered due to familiarity and ease of DIY programming. However, to save recordings from the sound sensor, a more capable computer with storage options like an SD card or Wi-Fi was needed.
Twan Huijzer, Master's student in Mechanical Engineering at TU Delft, offered assistance with programming using a Raspberry Pi, which met these requirements.
The Amsterdam Sound project described in Section 2.1.3 provided clear guidance on constructing a sound measurement tool.
Research into the use of buttons in previous projects, particularly in games, was also conducted.

2. Connecting the components
The components are connecting with the ordered cables that are connected to the Raspberry Pi.

Connecting the sound sensor with the cables was done by soldering and the button was connected with jumper wires.

3. Write the code
The code was written by Twan Huijzer. See Appendix C for the code.

4. Making the housing
A QR code linking to the survey needed to be prominently displayed on the device for user accessibility. The Raspberry Pi was positioned in the centre of the laser-cut box to maximize space for the attached cables.

These factors determined the size and design of the sensor box.

The Raspberry Pi required ventilation to prevent overheating, so the housing was designed with air vents. Instructions for using the tool were also included to ensure proper understanding.

The physical design was created using laser cutting (see Figure 25) for aesthetic reasons, including the incorporation of text and the QR code on wood, providing a user-friendly appearance.

6. Manual

A Manual was created in Adobe InDesign, which includes detailed instructions on how to use the prototype as well as a consent form required for participating in the test.

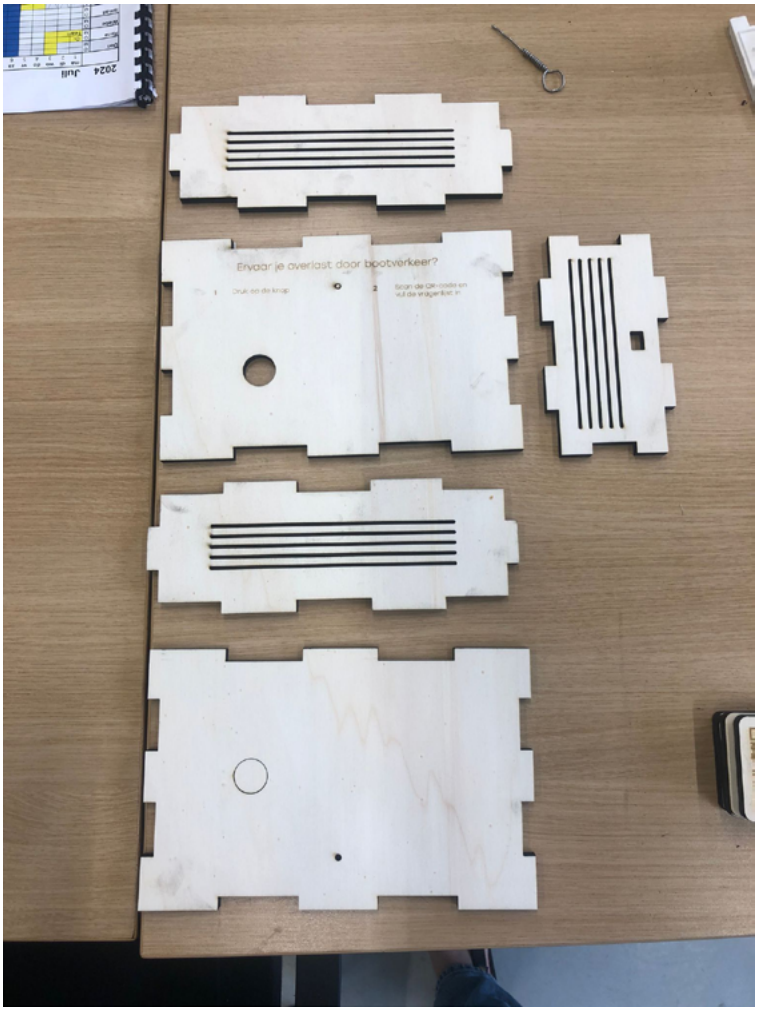


Figure 25. The laser cut box

Figure 26. The nuisance reporting box without hardware

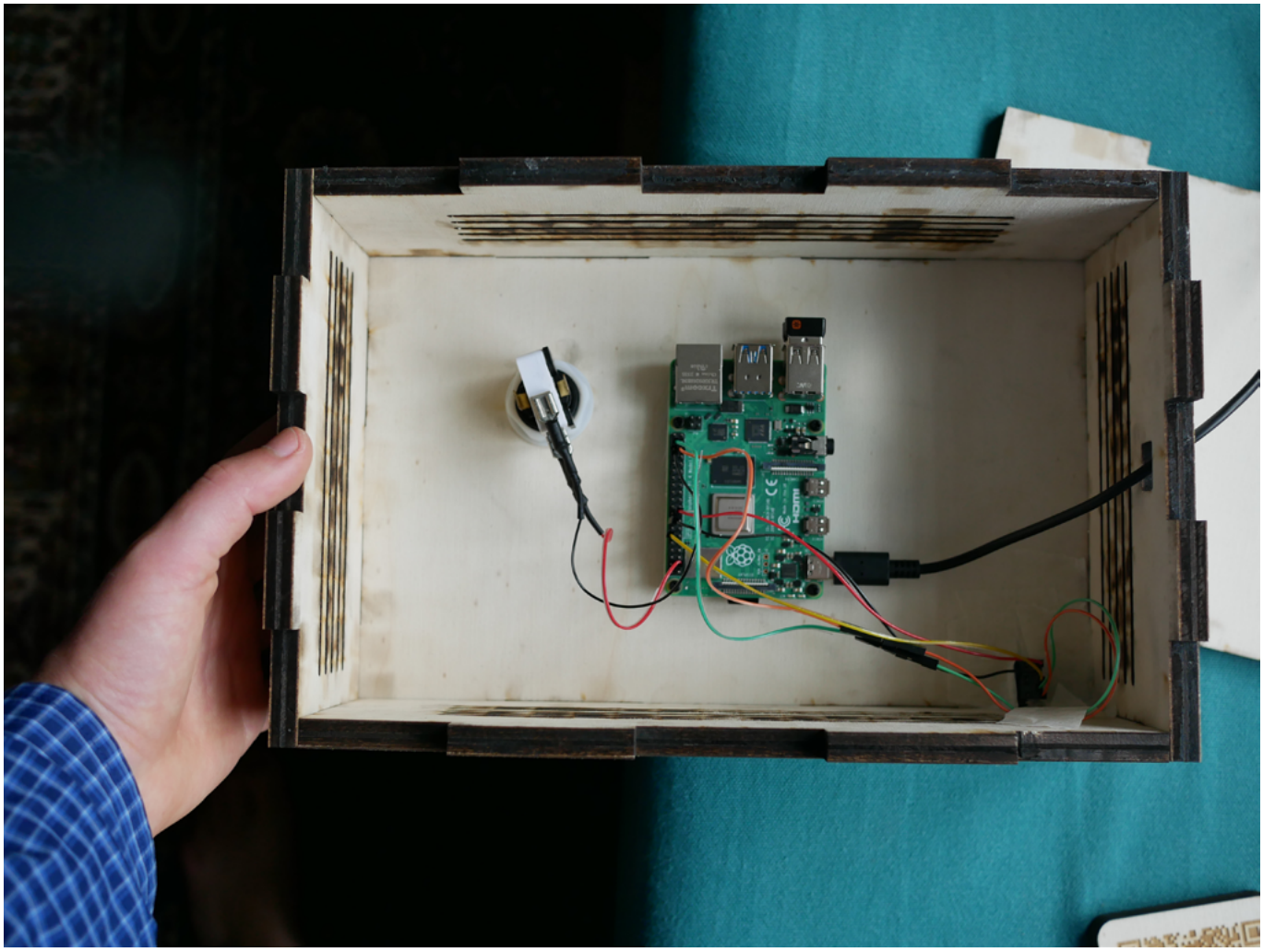


Figure 27. The nuisance reporting box with hardware

Figure 28. The big red button

Visualisation of Nuisance Data

3.5.3

The prototype was tested using the 'Three-Day Prototype Test' described in Section 3.6. The data from these tests are presented through a visualisation shown in Section 6.3.
I visualized the information on environmental conditions and the experience of nuisance using Adobe Illustrator and InDesign. This was necessary because the data from the survey in Microsoft Forms did not provide a clear overview. By presenting the data myself, I was able to determine how to visualize it effectively. Additionally, I listened to the recordings made in the reports and included these in a visualisation as well.
The decibel measurements of these recordings are not showing accurate results because the sound sensor requires further programming.

Three-Day Prototype Test

3.6

N. Participants	**4**
Location	**Participant's homes**
Duration	**3 days**

A test with four participants was conducted in their homes. The houseboat residents were asked to report nuisance with the provided prototype. The data on their nuisance was based on real-time experienced nuisance and used for data visualisation.

The test of the two components took place over a three-day period at the participants' homes. While a three-day test is time-consuming, it allows participants more time, thereby reducing pressure. Moreover, it increases the likelihood that they will experience and report nuisance.

Two participants tested during the weekend, when boat traffic is the busiest.
The other two tested during the week due to time constraints.

Location 1
Two individual houseboat residents, participant 1 & 2, who live on the same houseboat, tested the prototype on different assigned days. (See figure 29)

Location 2
Participant 3 tested the prototype and experiences less nuisance compared to the other participants in this test. (See figure 30)

Location 3
Participant 4 lives on the Prinsengracht, the canal with the busiest vessel traffic in Amsterdam. (See figure 31)

Figure 29. Location 1

Figure 31. Location 3

Figure 30. Location 2

Interview Evaluation

3.7

Method	**Interview Evaluation**
How	**Microsoft form**
Duration	**30/45 minutes**
N. Participants	**4**

After the '*Three-Day Prototype Test*' with the prototype, an interview was planned with the houseboat residents to discuss their experience with the prototype.
Evaluating the prototype is an important part of the design process. This helps us determine what needs improvement and what should remain in the design.

The interview lasted around 30 to 45 minutes, during which I filled in a Microsoft form while listening to their responses to the questions. The interview was also recorded so I could review the conversation later.

The Microsoft form including the Evaluation Interview questions consisted of two parts:

- **Data on Nuisance**
  This section evaluates whether the tool was used as intended and includes a survey to assess the residents' experience.
  The results of the '*Three-Day Prototype Test*' were presented, and the residents were asked to give their opinions on these results.
- **Houseboat Resident's Needs**
  This section assesses which aspects of the prototype meet the residents' needs and what improvements are necessary to enhance it. Statements were presented, and residents were asked to rate their agreement on a scale from 0 to 10, followed by an explanation of their reasoning.

Data on Nuisance

3.7.1

The qualitative and quantitative data that comes out of the test should be valuable information about their experience of nuisance. The opinion of the participants on the '*Data On Nuisance*' after the 'Three-Day Prototype Test' was asked for the evaluation of the design.

Q1 and 2 were addressed during the Interview Evaluation.

Q1:
Is the survey filled in as intended?

Q2:
Does the 'Data On Nuisance' reflect the houseboat residents' experiences according to the houseboat residents?

See figure 32 for the questions asked in the Microsoft Form.

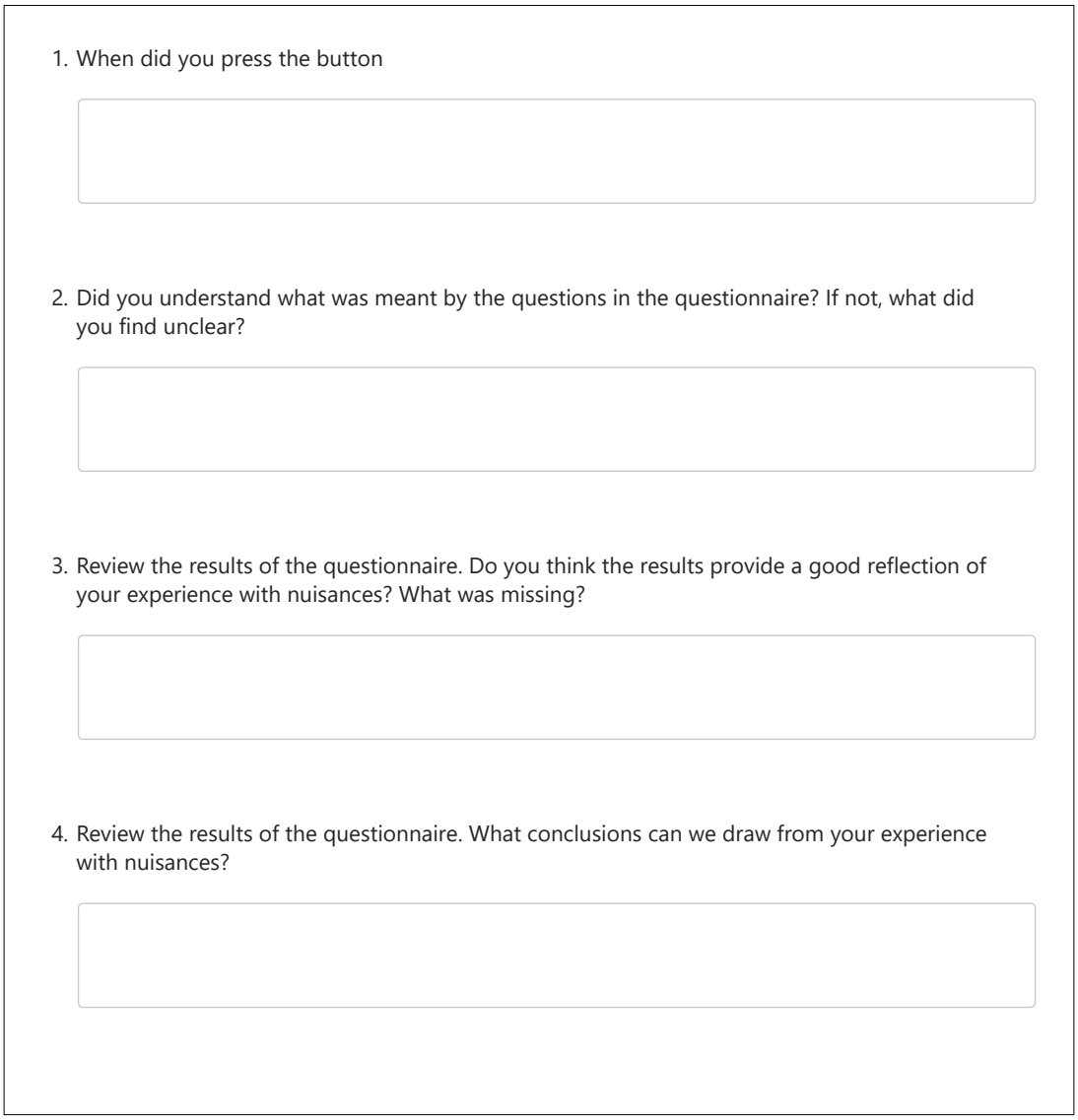


Figure 32. Microsoft Form for the evaluation of the 'Data on Nuisance'

Houseboat Residents' Needs

3.7.2

The tool needs to give the feeling of empowerment, increase the feeling of trust, lower frustration and ease the process of reporting nuisance as explained in Chapter 5.

Q1,Q2,Q3 and Q4 were addressed during a conversation with the participants.
During the conversation I gave them a statement and they had to say if they agreed or disagreed with the statements.

Q1:
When do houseboat residents feel empowered when reporting nuisance?
See figure 33.

Q2:
How can the tool increase the feeling of trust towards reporting nuisance?
See figure 34.

Q3:
Is reporting nuisance easily and quickly done?
See figure 35.

Q4:
How do houseboat residents want to express their frustration?
See figure 36.

Empowerment

These questions are about the support the design has provided you over the past 3 days.

5. To what extent do you agree with the following statement:
   '*The design helps me communicate my experience of nuisances to policymakers*'?

0	1	2	3	4	5	6	7	8	9	10

strongly disagree — Strongly agree

6. Why?

7. To what extent do you agree with the following statement:
   '*The design gives me control over the problem*'?

0	1	2	3	4	5	6	7	8	9	10

Strongly disagree — Strongly agree

8. Why?

9. To what extent do you agree with the following statement:
   '*I have the autonomy to make my own decisions while using the design*'?

0	1	2	3	4	5	6	7	8	9	10

Strongly disagree — Strongly agree

10. Why?

11. To what extent do you agree with the following statement:
    '*The design challenges me to utilize all of my potential skills*'?

0	1	2	3	4	5	6	7	8	9	10

Strongly disagree — Strongly agree

12. Why?

Figure 33. The assessment of empowerment

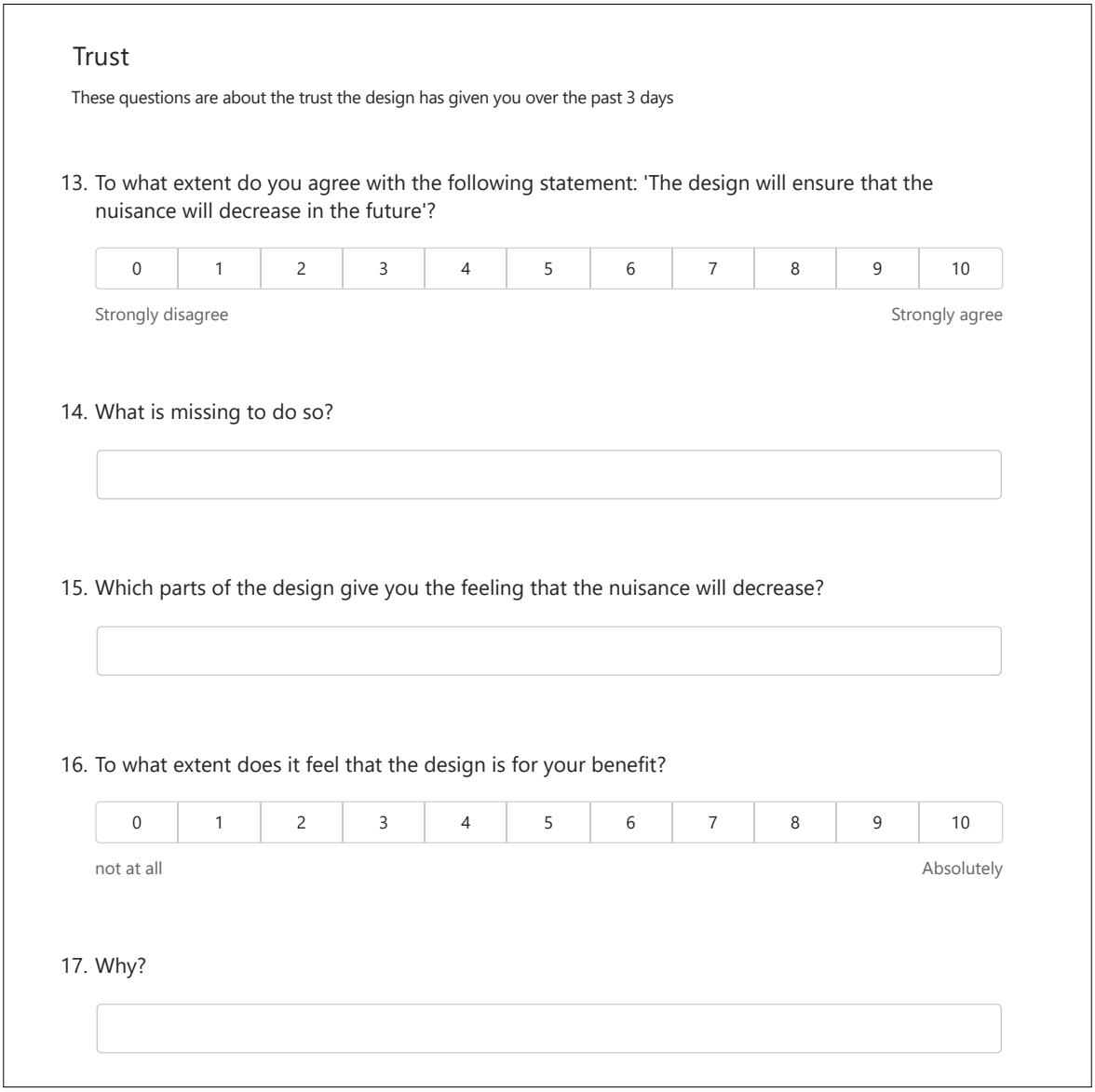


Figure 34. The assessment of trust

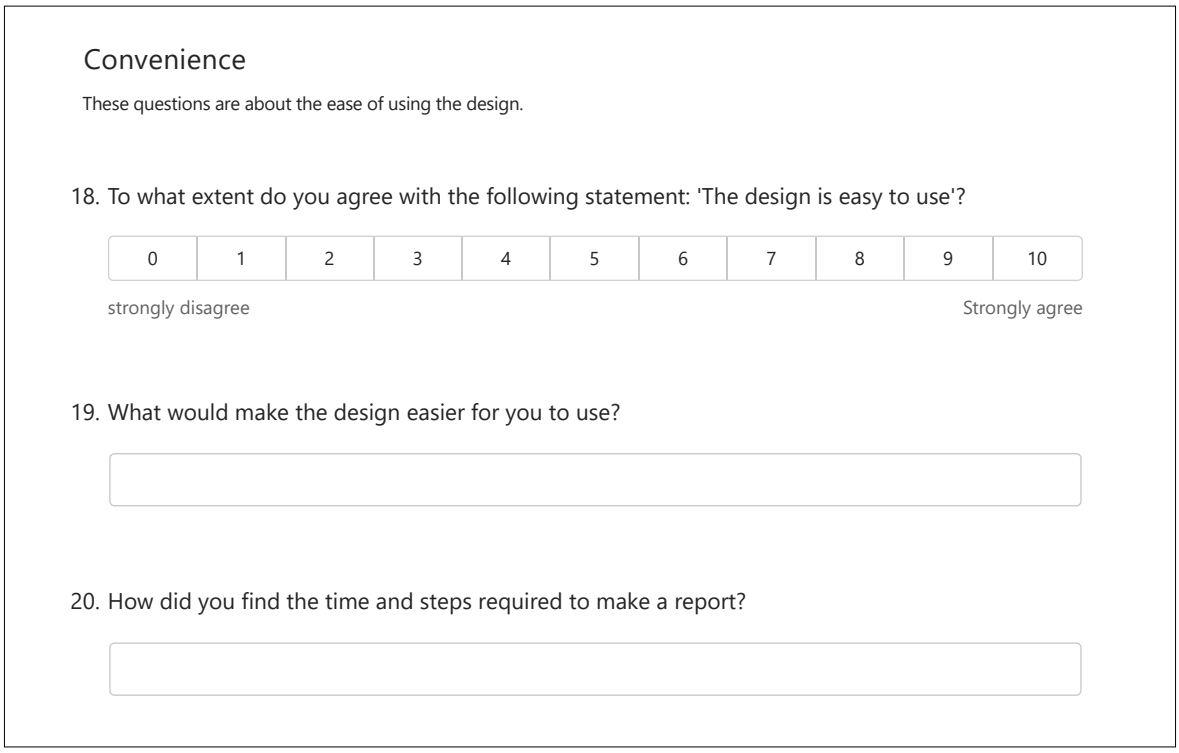


Figure 35. The assessment of convenience

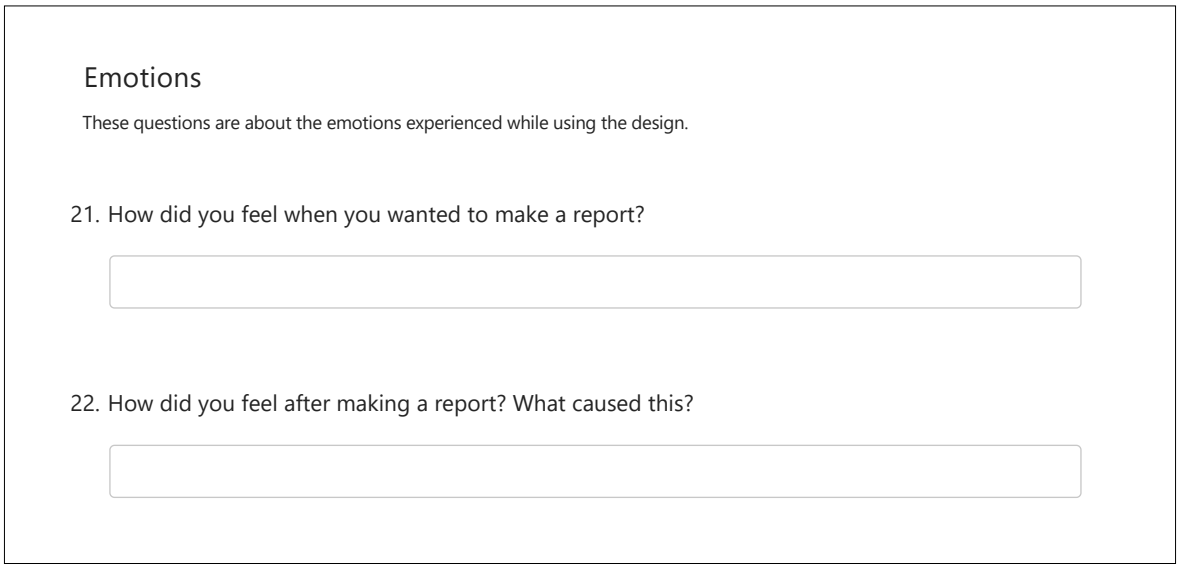


Figure 36. The assessment of emotions

Context

4

The outcomes of the methods used for analysing the context are presented in this chapter. Section 1 covers the municipality of Amsterdam's perspective on reporting nuisance. Section 2 presents the interview results, including the locations and photos of eight different houseboat residents. Section 3 outlines the four themes that emerged from the interviews.

The Ideal Nuisance Report

Municipality Of Amsterdam

4.1

With **Thomas Meindertsma**
Function **Senior data-analyst**
@ **The municipality of Amsterdam**

The conclusions from the interview with Thomas:

Scalable
The evaluation of nuisance experiences should be scalable to cover different regions of Amsterdam, providing a comprehensive overview of the nuisance.

General reflection
The design should reflect the overall perception of the houseboat residents.

Specific information
Specific information about the nuisance experiences is needed, which the municipality can use to prioritize actions to address the nuisance.

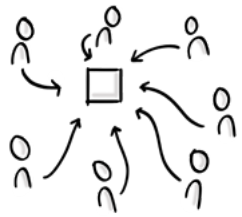


Figure 37. Scalable

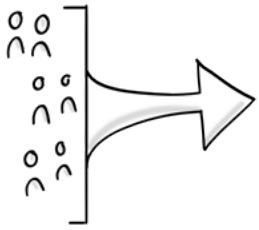


Figure 38. General reflection

Figure 39. Specific information

What does the Digitale Gracht do and how is reporting nuisance relevant for you?

"Well, we create policies for water traffic, and one of the objectives is to keep the city accessible by water, while another is to maintain the city's liveability. *For this, it is important to know where the limits are and which factors in the traffic contribute to nuisance, which negatively affects liveability.*
We want to gain as much insight into this as possible. Currently, people approach the municipality, they report visible issues or nuisance. So, we do receive information from people who contact us. When making new policies, we actively seek out people who can provide input or assess the situation, such as through participation.
But that's specifically for making new steps. What this can achieve is to go beyond the momentary nuisance that people report. While we take these reports seriously, they are also dependent on whether someone is willing to make a report. Some people do this very often, others less so. We are always cautious about potential biases, or we are not

“We don’t really progress because we lack specific information.”

sure what biases may be present."

And what is that bias?

"Mainly whether people know how to find the right channels and if they trust that something will be done about their report. Some people report an issue, but it doesn't get resolved. This could be because it was overlooked, or because it is difficult to address. We look at these reports together to see what picture they present, but we are also aware that it depends on who makes the report and that we don't always know the reason behind it. There is a description of the nuisance, but it could be that someone is very frustrated. It could also be that someone thinks if I report often, I will be taken more seriously. It could also be that someone thinks it won't be taken seriously anyway, so they stop reporting. *So, actually, it is not a direct form of information for us."*

What would the ideal nuisance report look like for you?

"One that is more objective in the sense that it provides a good reflection of the general perception within the entire target group. I think that's the most important point. Additionally, it should be specific, providing us with insight into what the actual problem is. While this is often the case, it's not always clear. So, understanding the cause of the nuisance - who or what is causing it. Not necessarily specific individuals, but is it large tour boats or individuals with their own boats? Is it primarily in the evening or during the day? Is it caused by music, shouting, public urination, or underwater construction work causing a lot of noise? We are familiar with some of these aspects, but any insight into a structured analysis of the main factors and whether they are consistent, or if everyone is affected differently, or if it's very localized. For example, there might be more nuisance from boats passing closely at one corner of a canal, while there are mainly issues with rowdy behaviour elsewhere. *An analysis or something that provides insight into the broader picture of how it is for houseboat residents."*

So, at the moment, if someone reports an issue, and they do it ten times for the same thing, for instance, how do you deal with that?

"I really need to address two things about that. The first is that these reports don't primarily go to policy departments, but rather to supervisory and enforcement departments, or mainly to the service provision departments. . Additionally, these reports are used to gain insight on a larger scale, such as whether nuisance is generally increasing and in which category. These are the insights that we, as a policy department, utilize. This is a source we always use, but we are always aware of its limitations. One report might mean there has been frequent nuisance, or it might mean it happened only once. Some people say ‘I always have trouble here’ but don't specify how often. So, the reporting system is aimed at solving the problem.
The primary goal is for the first line, a supervisor or service provider, to resolve what someone is experiencing trouble with. For the second goal, to gain insight into the bigger picture, it's quite suitable because we know which neighbourhood it was and which subcategory of nuisance the report falls into.
But someone who reports doesn't get asked, ‘Can you specify exactly how often it occurs?’ The system doesn't go into much detail about that, and that's not its primary purpose. We also don't want someone to have to fill out a whole survey just to report a nuisance.
So, mainly for the second goal, we can take the first step towards insight, but afterwards, we don't really progress because we lack specific information."

Interviews with Houseboat Residents

4.2

Interviews were conducted with eight houseboat residents in Amsterdam, who all experience nuisance caused by boat traffic. All the participants that I talked to are presented in this chapter. Four out of the eight participants preferred to stay anonymous, but agreed to share their story and a photo of their houseboat.

Figure 40.
Locations of the eight houseboats of the participants of the interviews

The stories of four participants are highlighted through quotes and interview descriptions, all aimed at giving the reader a better understanding of houseboat residents' experiences.

I will first provide a brief summary of the interviews before presenting their individual stories in this chapter.

Main outcomes
Participant 1 explains that past experiences with nuisance have affected her tolerance level. The sound of boats triggers a stress response due to previous negative experiences. Although major disturbances are no longer common, she and her partner have a low tolerance for boat noise and become frustrated quickly.

Participant 2 describes that when a boat passes by, large waves cause their houseboat to rock.

Participant 3 also mentions that boats create large waves, causing their dinghy to rock and pound against their houseboat.

Participant 4 primarily experiences nuisance from the sound of the screw of the engine when boats are turning.

Regarding the role of the municipality and citizens in reporting nuisance, the participants feel that residents should advocate for their living environment, but believe the municipality should take responsibility for addressing these reports. Participants feel that reporting nuisance does not result in the necessary action.

Participant 1 emphasizes that the municipality must take responsibility for responding to reports of nuisance. Without follow-up action, residents may become discouraged and stop reporting issues, as the process feels frustrating and ineffective. Participant 2 agrees that reporting nuisance is not effective, noting that after completing the required steps, little to no action is taken.

Figure 41.
The four participants


SUZUKI

“If we report something, they [the municipality of Amsterdam] need to make sure that something is being done with it, otherwise, we will stop reporting”

4.2.1

Location **Amsterdam-Centre**

Participant 1 **Nicoline**

Nicoline has been a houseboat resident in Amsterdam since 1982 and was part of a houseboat community group in the past. She experienced that moving to another houseboat in the same canal reduced the amount of nuisance enormously.

◀ *Figure 42.* Nicoline

When was the last time that you experienced nuisance by boat traffic?

"I woke up this week from boats passing by at night. They were passing by very quietly, but you can hear the screw of the engine. And I think that if it happens more often, I will eventually sleep through it again, but for now, it's still like “huh.” It's a sound that is unfamiliar. But tour boats don't pass by here. That's really an improvement compared to where we used to live."

What is your reaction when you hear the sound of the boats?

"It triggers an old stress reaction. So, despite the fact that the really significant nuisance was quite a while ago, we both notice that our tolerance level here is very low.
So, we get angry very quickly. While, I also forget things quickly.
And now as the weather is slowly getting nice again, it's slowly being stirred up.
At the location of the previous houseboat we really suffered from tour boats, because they came from two directions. And we used to row in front of the door. Well, you can't imagine that now. It's life-threatening. You would just get pushed away or something, right?"

What is according to you the role of the municipality of Amsterdam and the citizens in reporting nuisance?

"I think it's good for residents to stand up for their living environment, but you have no influence at all. So, the municipality has to do this. If we report something, they need to make sure that something is being done with it, otherwise, we will stop reporting. At some point, you stop calling the number for reporting nuisance because it just makes you grumpy. You've already experienced it and then you have to report it."

“The municipality forgets that public space cannot simply be exploited for private purposes.”

4.2.2

Location **Amsterdam-East**

Participant 2 **Olaf**

Olaf mostly experienced disturbance caused by boat traffic during the Amsterdam Light Festival, where an artwork is yearly exposed during the winter. The winter is a time of peace and rest for him and his family.

◀ *Figure 43.*
Bella, Reva and Olaf

When was the last time that you experienced nuisance by boat traffic?

"That was last weekend. A boat passed by with enormous under waves, causing the rudder to start rattling immediately, and the boat began to rock significantly. It’s not that everything is shaking, but there are just too many waves, and it splashes.
It’s faster than walking pace. In that sense, it’s not very serious, but still. People who passing by with the boat never take that into account. They have no idea that people live in these houseboats. And you often just hear the sound under water. The screw of the engine makes noise. Well, it’s a small annoyance. But that was the last time, the most recent."

So if this is a minor annoyance, what do you compare it with?

"Well, when it is a very nice day, in the summer, when the weather is nice, there are always more boats, then it is much more intense, then it just goes on all day long.
The situation is more chaotic then, The rental boats in particular are, in general, just people who actually cannot sail. So then there is shouting, then there is noise, sometimes music is made,sometimes with amplified music.
And then when the weather is really nice, the swimming pier is full, so then you have the combination from a lot of boat traffic, swimmers, sometimes tour boats pass through,
Then it becomes quite a madhouse here."

How do you experience the Amsterdam Light festival?

I think it is an example of where commerce, under the guise of art, has gone too far in the city, with an activity that, in my opinion, is not necessary.
We live n a city that is already quite compact, there is a lot to get through, and you should also take the people who live here into account. The municipality forgets that public space cannot simply be exploited for private purposes.

“...it would be really useful if there was a tool that made that [reporting nuisance] much easier, that allowed you to easily report how often it happens...”

Figure 45. ▶
Jacco

4.2.3

Location **Amsterdam-East**

Participant 3 **Jacco**

Jacco is UX designer and he already has ideas on how to tackle the nuisance caused by boats that sail above the speed limit. For instance, he made a banner with the speed limit which he attached to his boat.

We were just talking about the fact that you do not experience nuisance from the bathers here, but especially from the boats. Can you elaborate on this?

"So we don't actually have any problems with bathers, but the passing small boats cause serious waves if they sail too fast, and that actually bothers us the most. Moreover, we have a dinghy, which is in winter storage now, that is rocking and pounding against the boat. And that is annoying.
You can actually only sail at a speed of 6 km per hour here and that is absolutely not adhered to. Then I always think, why isn't there a little more enforcement so that our dinghy doesn't suffer any damage?"

And have you also reported nuisance to the municipality?

"I've done that a few times, but you have to go through a number of steps to do that completely. And then in the end not much happens.
At least it's not something I can see. I can imagine that if reports are made more often, there might be some enforcement.
But you have to do quite a lot of things to report nuisance.
So for that it would be really useful if there was a tool that made that much easier, that allowed you to make a very easy report to show how often it happens, so that perhaps more enforcement could take place."

Figure 46. ▶
The Liège


LIÈGE


Mulligans

“I have many soundproof windows, but now it’s still coming in through the bottom.”

Location **Amsterdam-Centre**

Participant 4 **Wouter**

The tour boats turn around at Wouter’s houseboat the whole day. The screws of the engines make a high sound when they make their turn.

◀ *Figure 48.* Wouter

4.2.4

When was the last time that you experienced nuisance by boat traffic?

"That’s been going on almost every day lately, but that’s a new phenomenon.
It comes from the tour boats, which fortunately all run on electric motors now. But there is also a downside that you really notice as a houseboat resident. That is the screw.
And that goes on all day in my spot because they turn here for those crooked houses on the other side that they want to see as an attraction. So, they go forward and backward and back and forth. That is sometimes very annoying. Yes. Or actually, it is always very annoying."

Figure 49. Wouter portrait ▼

Figure 50. Participant 5

Location **Amsterdam-Centre**

Participant 5 **Anonymous**

4.2.5

Location **Amsterdam-Centre**

Participant 6 **Anonymous**

Figure 51. Participant 6

4.2.6

Figure 52. Participant 7

Location **Amsterdam-Centre**

Participant 7 **Anonymous**

4.2.7

Figure 53. Participant 8

Location **Amsterdam-Centre**

Participant 8 **Anonymous**

4.2.8

Four Themes

4.3

The Deductive Thematic Analyses of the eight interviews with houseboat residents resulted in four themes. These themes were created as described in Section 3 of Chapter 3.
The value of these four themes lies in their universal relevance to all participants, their originality, and the diverse novelty that they offer.
Each theme is assigned its own symbol, so I can refer to the themes using these symbols.
Visualisations are added to each theme, corresponding to their content.

Distrust
Houseboat residents distrust the municipality in the enforcement for nuisance

Noise and Waves
Nuisance caused by vessel traffic occurs due to noise pollution and waves

Quality of Life
Nuisance caused by vessel traffic affects the quality of life of houseboat residents

Personal Context
The intensity of nuisance depends on the personal context of the houseboat resident

Distrust

Houseboat residents distrust the municipality in the enforcement for nuisance

4.3.1

There is a lack of enforcement to do something about the nuisance

According to the participants there is not enough enforcement to do something about the occurring nuisance.
"Waternet or the police simply do not have enough capacity. They simply cannot handle this at all on very busy days. And I can't blame them for that, you can't be everywhere." (Participant 2)

There is a lack of trust in reporting nuisance

The participants are demotivated to report nuisance, because it doesn't lead to action. According to them, the municipality does not change their policy/enforcement even if the municipality knows the burdens.
"And according to the municipality, the purpose of this [reporting nuisance] is to identify where the bottlenecks are. But even though they know where the bottlenecks are, they still do nothing because they don't have the manpower." (Participant 8)

The communication after reporting nuisance feels inhuman

After reporting nuisance the houseboat residents experienced that they often get no response or an automatic response.
"But the standard answer that 'nothing is done with it' if they can't do anything with it, is the same every time. So there is no human link" (Participant 5)

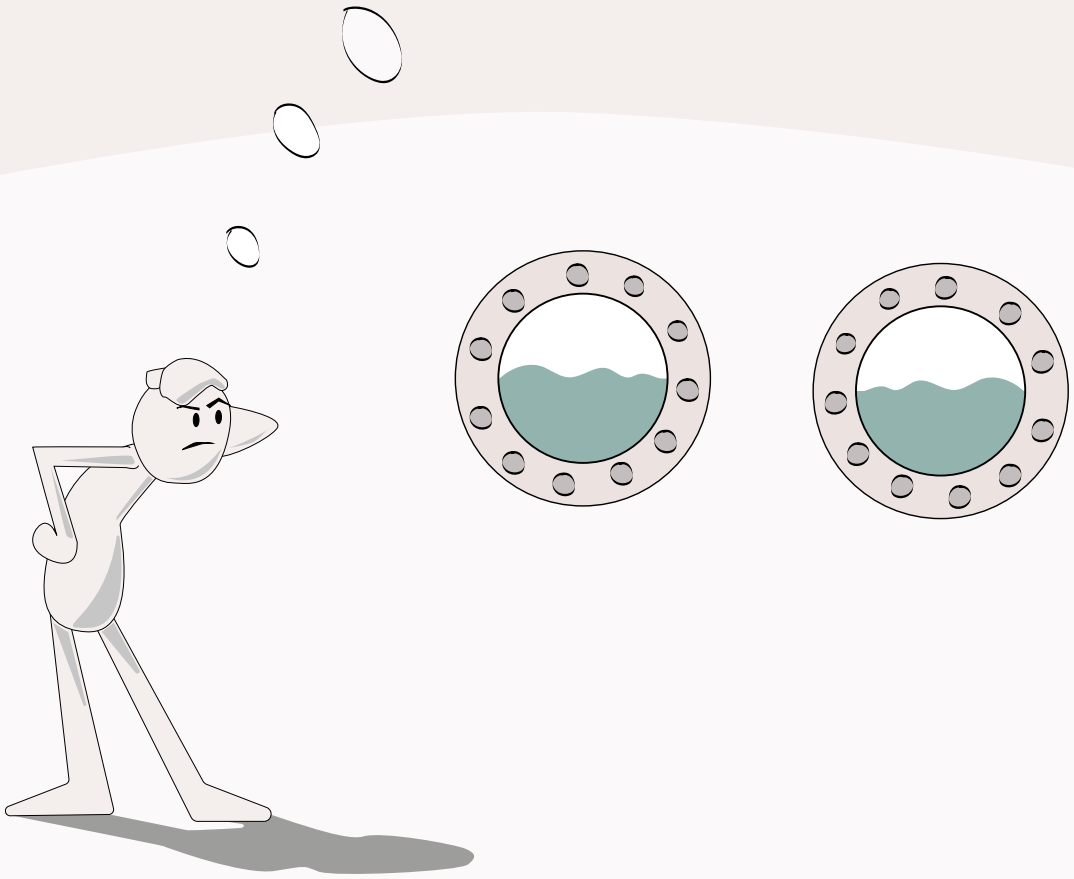
And to be listened to, a participant had to put a lot of pressure on the policymakers to make a change.
"If you don't file or threaten a lawsuit with the municipality of Amsterdam, I notice that they hardly respond anymore." (Participant 8)

The level of nuisance is higher when the driver/shipping company is earning money

The perception of nuisance is influenced by the intention of the boat driver. Nuisance increases if the boat driver is earning money out of the boat trip.
"It is a revenue model for the municipality. Far too many permits have also been accepted. Because the tour boats have an incredibly strong lobby." (Participant 5)

Figure 52. Houseboat resident distrusting policymakers ▶

“Waternet or the police simply do not have enough capacity. They simply cannot handle this at all on very busy days.”



Noise and Waves

Nuisance caused by boat traffic occurs due to noise pollution and waves

4.3.2

Boat traffic causes sound disturbance above and underneath water level

The **screw of the motor** makes a disturbing sound under the water.
"The diesel engine that was standing still made noise and a lot of humming. But now those engines are so strong that the screws bother you.
(Participant 4)

The people on the boat are making noise by **music or shouting**.
"So then there is shouting, there is noise, sometimes music is played, sometimes with amplified music."
(Participant 2)

The **tour boats** are making noise when giving announcements.
"The boats cause a lot of disturbance because they tell the same nonsense story every time. They are noisy as they pass by"
(Participant 6)

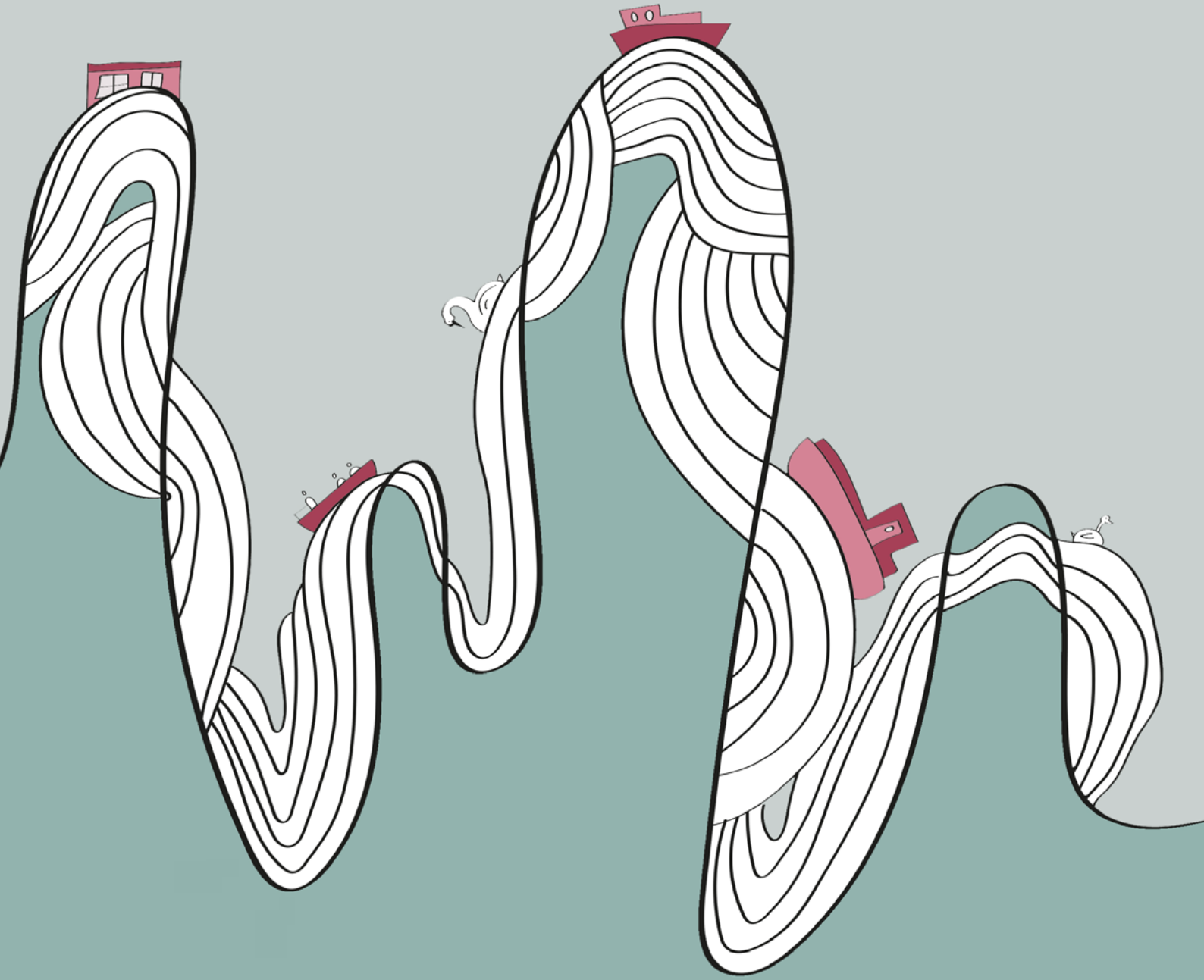
Waves caused by boat traffic causes swaying the houseboats

The passing boat are sailing faster then allowed which causes waves and the manoeuvring of sloops through the canals causes disturbing waves.
"But there is consistently speeding. All the boats here are affected by it. I'm not the only one, and you will hear this from others as well."
(Participant 7)

The nuisance depends on the experience of the boat driver

The boat that have little experience with driving a boat cause more nuisance.
"Well, basically, you just had a constant traffic jam of boats here, and there were a lot of people in boats who couldn't navigate, which leads to actual collisions, and they would crash into your ship."
(Participant 2)

Figure 53. ▶ Houseboats located in water waves and sound waves



Quality of Life

Nuisance caused by vessel traffic affects the quality of life of houseboat residents

4.3.3

The nuisance is constant during peak season
The houseboat residents constantly experience nuisance during peak season, especially during nice weather.
"And when the weather is nice, you have a boat passing by here every five seconds."
(Participant 5)

Nuisance affects the living enjoyment of houseboat residents
The nuisance affects the houseboat residents in such a way that it heavily affects their liveability and health. The disturbance is so significant that the joy of living is often not present.
"It's like living in a coffee grinder. That's terrible. It's really unbelievable."
(Participant 6)

Houseboat residents have no power to solve the problem
The role of the municipality of Amsterdam is to take action while houseboat residents report the occurring nuisance. However, the lack of immediate action following such reports often leaves houseboat residents feeling powerless.
"*I think it's good for residents to stand up for their living environment, but you have no influence whatsoever."*
(Participant 1)

Houseboat residents don't feel recognized by boat drivers
Visitors and residents of Amsterdam are sometimes unaware that houseboats are actual homes where people live. They may not realize the impact of boat traffic on houseboat residents.
"Some people think they can use your boat as a mooring spot, and I don't mind that in itself. Sometimes I allow it, but most of the time you have those cheeky ones who claim it as well and who walk right through your house."
(Participant 4)

Houseboat residents want to express their frustration
When experiencing nuisance, the houseboat residents report nuisance to express their frustration. Or they confront the person who is responsible for the nuisance which often leads to conflicts.

"Usually, I am highly irritated and want to get it off my chest, so I file a report."
(Participant 3)

And

"I quickly express my frustration by shouting harsh words and, you know, cursing."
(Participant 5)

Figure 54. ▶
A person being sad

Personal Context

The intensity of nuisance depends on the personal context of the houseboat resident

4.3.4

The level of nuisance increases when being able to see the cause
Houseboats differ in their visibility of passing boats. Seeing the boats as they pass increases the feeling of nuisance.
"Well, if I'm sitting there by the water and I 'see' them speeding, then it's different. Because then it bothers me again that they're speeding so much."
(Participant 3)

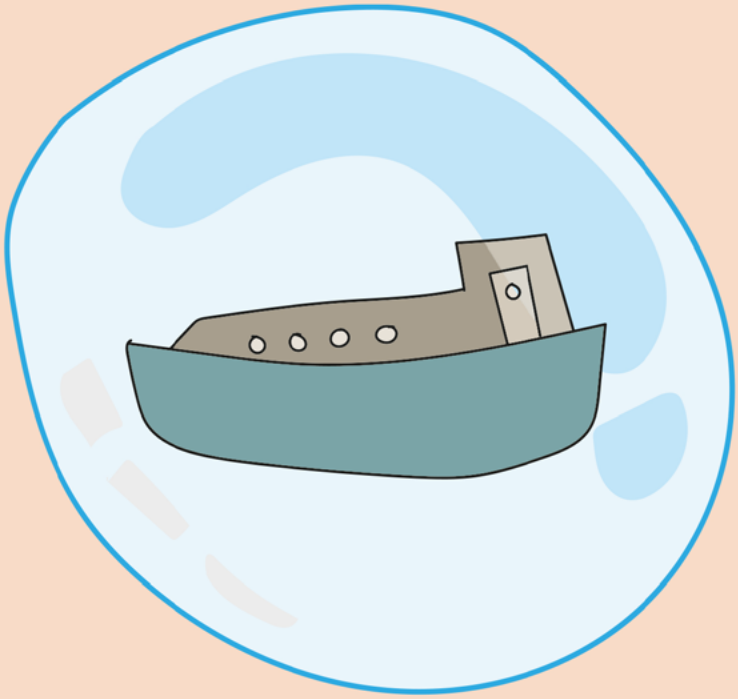
The level of nuisance depends on the person
The level of nuisance depends on the activity that the houseboat residents is doing. But it also depends on the level of sensitivity, which differs per person.
"I think if I were deaf, I would have a very good life here. But I also think that I'm more sensitive to it than the average person."
(Participant 8)

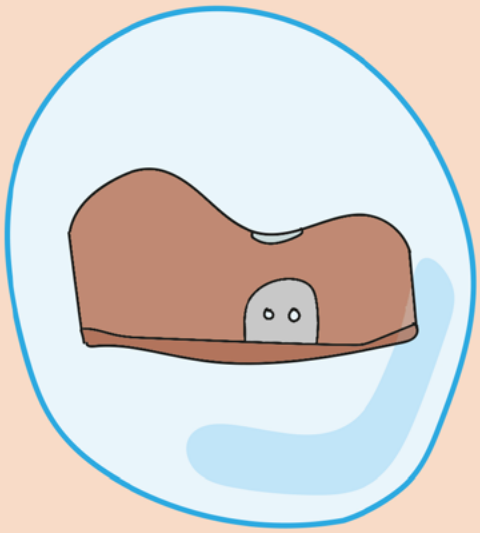
Past experience of nuisance has influence on the level of nuisance
A bad experience in the past, can increase the level of experienced nuisance as it can trigger a stress reaction.
"Despite the fact that the really big disturbance was quite a long time ago, we both notice that our tolerance level here is very low."
(Participant 1)

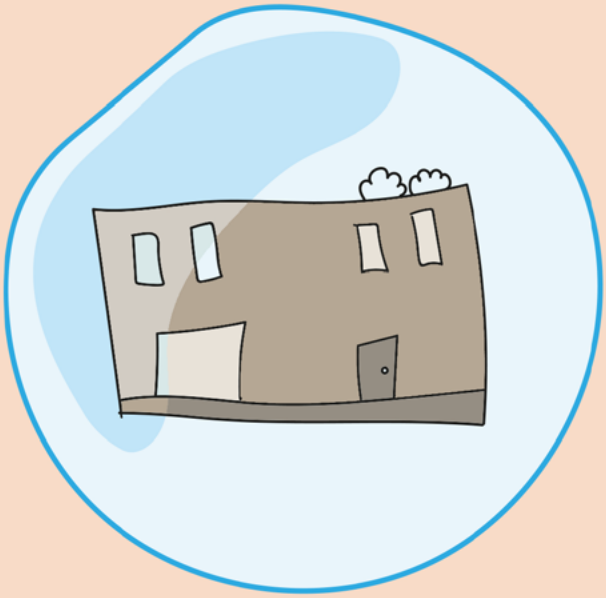
Nuisance builds up until the limit is reached
Sound and/or waves cause nuisance when a certain line is crossed.
"For a while, you can tolerate it just fine, but eventually, it starts to bother you. And at a certain point, you've had enough. Yeah, it builds up very slowly."
(Participant 8)

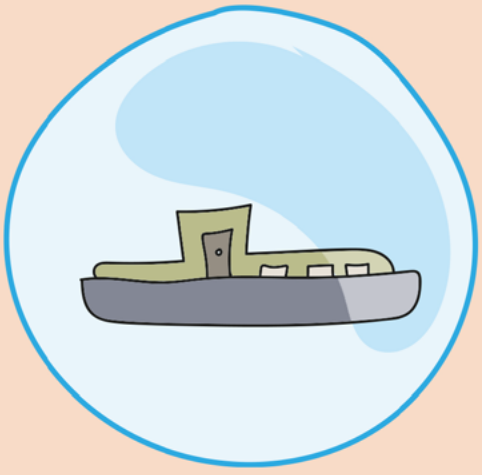
The nuisance level depends on 'when' it occurs
It really makes a difference when the nuisance is occurring. During the night the houseboat residents will be triggered during their sleep.
"At four in the morning, they come sailing by. And then you wake up again." (Participant 6)

Figure 55. ▶ Houseboats in bubbles









Design Requirements

5

Read this Chapter to learn about the design requirements and how they are connected to the results of the design process. Section 1 introduces the set-up of criteria for the design and explains how to read this Chapter. Section 2 delves into criteria of the 'Houseboat Residents' Needs', while Section 3 delves into criteria of 'Data On Nuisance' for the design.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Criteria

5.1

The design requirements are divided into two components:

1. **Houseboat Resident's Needs**
   In order to make the design work, it should fit with the needs and values of the houseboat residents. This theme shows what the design should provide in order to fit into its context. The target group of this theme are the houseboat residents.

2. **Data On Nuisance**
   This component shows what which data should be collected to reflect the houseboat residents' experience of nuisance. The target group of this theme are researchers and policymakers.

Criteria of the two themes are presented in two separate tables. The tables show main design criteria in bold and in order to give more details on how to provide the criteria, subsections are shown underneath the main section. The numbering starting with 'H' refers to the criteria for the Houseboat Residents' Needs, while the numbering starting with 'D' refers to the Data on Nuisance.
See table 2 for the explanation on how to read the table.

N.	Design requirement	Source	Explanation
H1/D1	**Main design requirement**	Previous results in the design process	The main design requirement can be seen as a overlapping theme
H1.1/D1.1	Criteria that supports the main design requirement	Previous results in the design process	The criteria is needed in order to meet the main design requirement above

Table 2. Explanation criteria table

Houseboat Residents' Needs

5.2

The design should enhance the reporting of nuisance, and in order to fit into the context, it must meet the needs of the houseboat residents. Table 3 presents the design requirements, which are derived from the following two themes identified through the Deductive Thematic Analysis:

- *Distrust*
  Houseboat residents distrust the municipality in the enforcement of nuisance

- *Quality Of Life*
  Nuisance caused by vessel traffic affects the quality of life of houseboat residents

The other two themes of the thematic analysis are more focused on the experience of nuisance itself, while these two themes are mainly related to act of reporting nuisance. Therefore, these two themes are the basis of the design requirements for the design for the houseboat residents. From these two themes, four main requirements emerged.

H1

» **Gaining the trust of houseboat residents in reporting nuisance**

Currently, houseboat residents distrust the process of reporting nuisance because they believe the municipality of Amsterdam is unable to resolve the issue for them. For the design to be effective, the residents must believe in its potential to make a difference.
Trust is defined as "the willingness of an entity (i.e., the trustor) to become vulnerable to another entity (i.e., the trustee)" (Schilke et al., 2021). To build trust, the design should give residents the sense that they are being heard when reporting nuisance and prioritize their well-being. Additionally, the system should be transparent about its operations and the reliability of the data.

H2

» **Making the design easy and quick to use**

Currently, reporting nuisance is time-consuming, which demotivates residents from participating. Houseboat residents dislike the process of reporting nuisance because it forces them to focus on the problem, when they would prefer to distract themselves from it. Therefore, the design should make reporting as simple and efficient as possible.

H3

» **Providing an outlet for residents to express their frustration**

Houseboat residents feel a strong need to express their frustration when experiencing nuisance. The design should allow them to use it as an outlet for their emotions.

H4

» **Empowering houseboat residents**

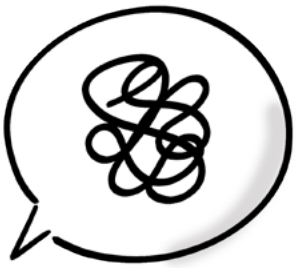
Currently, houseboat residents feel powerless in reducing the nuisance they experience. Empowerment is defined as "the capacity of individuals, groups, and/or communities to take control of their circumstances, exercise power, and achieve their own goals, and the process by which, individually and collectively, they are able to help themselves and others to maximize the quality of their lives" (Adams, 2008).

To foster empowerment, the design should make houseboat residents feel supported when reporting nuisance, provide them with control over the reporting process, and ensure the design aligns with the input they provide.

H1 Gaining the trust of houseboat residents in reporting nuisance

H2 Making the design easy and quick to use

H3 Providing an outlet for residents to express their frustration



H4 Empowering houseboat residents

Quality Of Life
Nuisance caused by vessel traffic affects the quality of life of houseboat residents

Distrust
Houseboat residents distrust the municipality in the enforcement for nuisance

Table 3. Criteria for 'Houseboat Residents' Needs'

N.	Design requirement	Source	Explanation
H1	**Gaining the trust of houseboat residents in reporting nuisance**	●	Houseboat residents are demotivated to report nuisance when distrusting the policymakers
H1.1	Provide a listening ear	▲	The houseboat residents do not feel recognised and listened to when reporting nuisance
H1.3	Provide humanly feedback after reporting	●	Houseboat residents currently feel unrecognised after reporting
H1.4	Provide clear explanations concerning the underlying logic and reasoning that have gone into the system's decision-making process	*(Shishkov et al., 2023)*	The level of trust can be enhanced by being transparent about how the system operates
H1.5	Show the systems accuracy	*(Shishkov et al., 2023)*	The level of trust can be enhanced by being transparent about the reliability of the system
H2	**Making the design easy and quick to use**	▲	Houseboat residents dislike the process of reporting nuisance because it forces them to focus on the problem, when they would prefer to distract themselves from it.
H3	**Providing an outlet for residents to express their frustration**	▲	Houseboat residents feel a strong need to express their frustration when experiencing nuisance.
H4	**Empowering houseboat residents**	▲	Currently, houseboat residents feel powerless in reducing the nuisance they experience.
H4.2	Show what effect the environmental stressors have on their liveability	▲	Nuisance affects the living enjoyment of houseboat residents
H4.2	Satisfy the need for competence, relatedness, and autonomy for houseboat residents	*(Adams, 2008)*	Self-determination refers to the ability or right of individuals or groups to make their own choices and control their own lives, which is crucial for the empowerment of the users.

Data on Nuisance

5.3

The design requirements for the data on nuisance are presented in Table 3. The target group for these design requirements consists of those analysing the data on nuisance, which in this case includes researchers and policymakers.

Four main design requirements emerged from reviewing the literature and analysing the following two themes that resulted from the Deductive Thematic Analysis:

- *Noise And Waves*
  Nuisance caused by boat traffic occurs due to noise pollution and waves

- *Personal Context*
  The intensity of nuisance depends on the personal context of the houseboat resident

D1

» **Identify the contextual factors that influence the experience of nuisance**

The design should identify contextual factors that influence the experience of nuisance. The themes highlight which contextual factors are important for the design to measure.

D2

» **Show the level of nuisance on a scale from 0-10**

The level of nuisance should be measured on a scale from -10, as described in the literature in Chapter 2, Section 1.2. The data generated by the design can thus be used for analysis and compared with other international research.

D3

» **Personalise the reporting system**

The seventh design requirement emphasizes the importance of gathering data for each individual, as every person reacts differently to environmental factors. This is supported by literature as well as the theme "Personal Context," which discusses the personal nature of nuisance experiences.

D4

» **Measure the environmental conditions that are produced by vessel traffic**

The eight design requirement is to also measure the environmental conditions of houseboat residents, to better understand the consistency of nuisance and further investigate the emissions from vessel traffic. This can not only provide insight into the environment but also help houseboat residents reflect on their experiences, while researchers and policymakers gain more information about environmental conditions.

Noise And Waves
Nuisance caused by boat traffic occurs due to noise pollution and waves

Personal Context
The intensity of nuisance depends on the personal context of the houseboat resident

Table 3. Criteria for 'Data On Nuisance'

N.	Design requirement	Source	Explanation
D1	**Identify the contextual factors that influence the experience of nuisance**	(*Haggett, 2012).*	Contextual factors such as the time and location influences the experience of nuisance
D1.1	Measure the moment of the occurring nuisance	*(Muzet, 2007)*	During the night, nuisance causes sleep disturbance.
D1.2	Identify the driver/shipping company when nuisance occurs		Houseboat residents explain that the experience of nuisance is influenced by the type of boat and boat driver.
D1.3	Identify the environmental stressor that is causing the nuisance for the individual	*(Pluess et al., 2023)* & 	Individuals respond differently to environmental conditions
D2	**Show the level of nuisance on a scale from 0-10**	Literature review: 'A questionnaire for measuring liveability'	Annoyance is internationally being measured this way when assessing the liveability of residents.
D3	**Personalise the reporting system**		The intensity of nuisance depends on the personal context of the houseboat resident.
D3.1	Identify the location of the houseboat		The intensity of nuisance depends on the location of the houseboat.
D3.2	Identify the past experience of nuisance		Nuisance is triggered when having endured a bad experience.
D4	**Measure the environmental conditions that are produced by vessel traffic**	Van Overveld et al. (2009) & (Zuurmond, 2021)	There is little research on the emissions of vessel traffic in urban areas & Measuring environmental nuisance is effective for starting a dialogue between stakeholders
D4.1	Identify the consistency of nuisance		The nuisance builds up till a certain limit is reached.

The Design

6

This chapter presents the initial design, "nuiSENSE," including a storyboard and its values. Additionally, all the details of the prototype used for testing will be provided. Finally, the visualisation of the data collected during the 'Three-Day Prototype Test' with the houseboat residents will be presented.

nuiSENSE

6.1

The first design I created using the design requirements from Chapter 5 is called 'nuiSENSE', a tool to evaluate houseboat residents' experience of vessel traffic-generated nuisance in Amsterdam. This design is used by houseboat residents to provide data on nuisance, which is then analysed by researchers. Policymakers will use this new information to update policy.

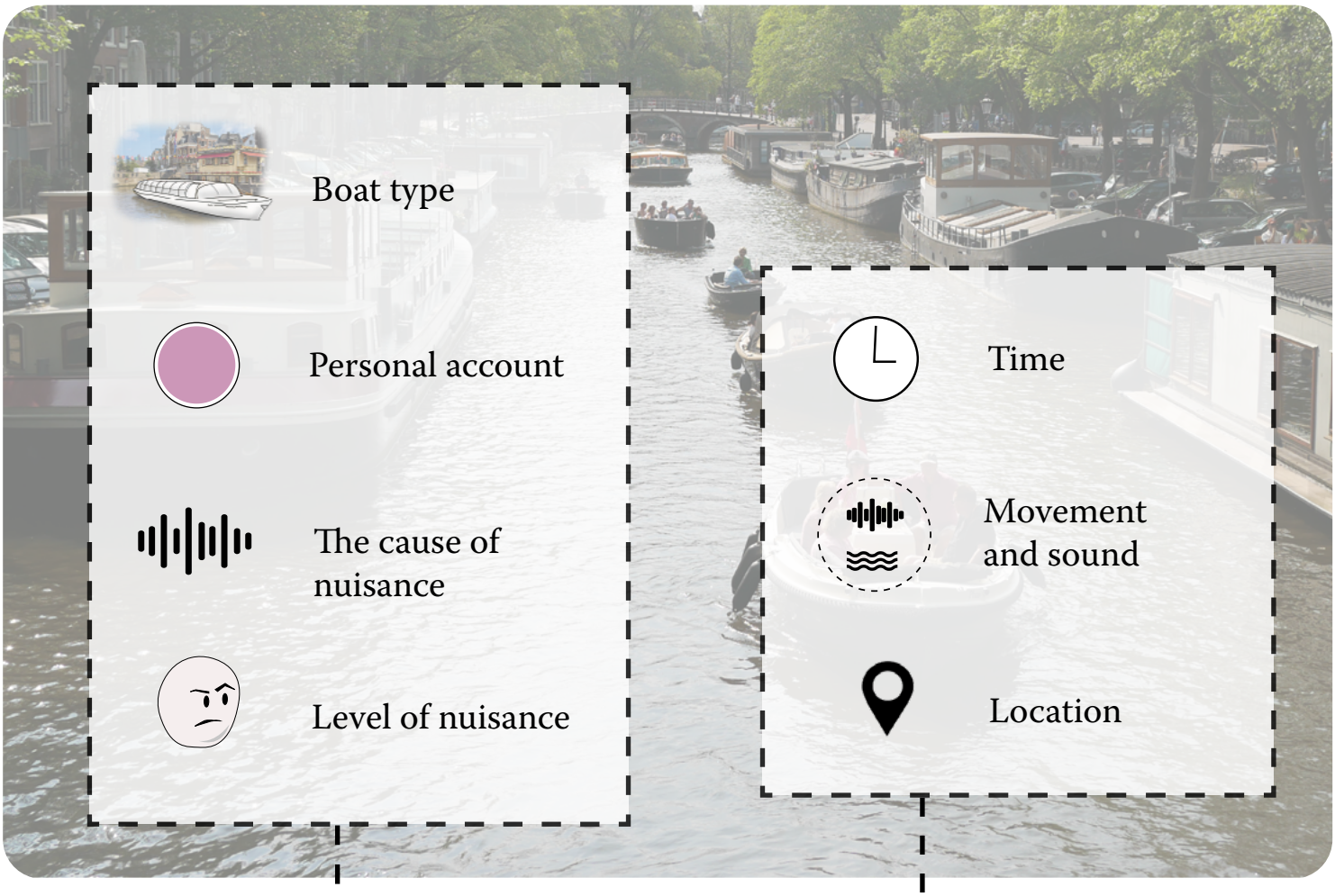
The first component, the Survey, asks residents about their experience of nuisance caused by vessel traffic. The second component, the Nuisance Reporter, gathers information about environmental conditions, such as sound characteristics, movement, time, and location.

Section 1.1 presents the content of the two components in a visualisation, supported by the design's values. Sections 1.2 and 1.3 shows the design's storyboard. Section 1.4 explains the involvement and responsibilities of stakeholders in the reporting system.

A prototype has been created based on the initial design of 'nuiSENSE.' Section 2 provides details of the prototype used for testing. Section 3 presents visualisations of the data on nuisance gathered during the 'Three-Day Prototype Test.'

Visualisation

6.1.1

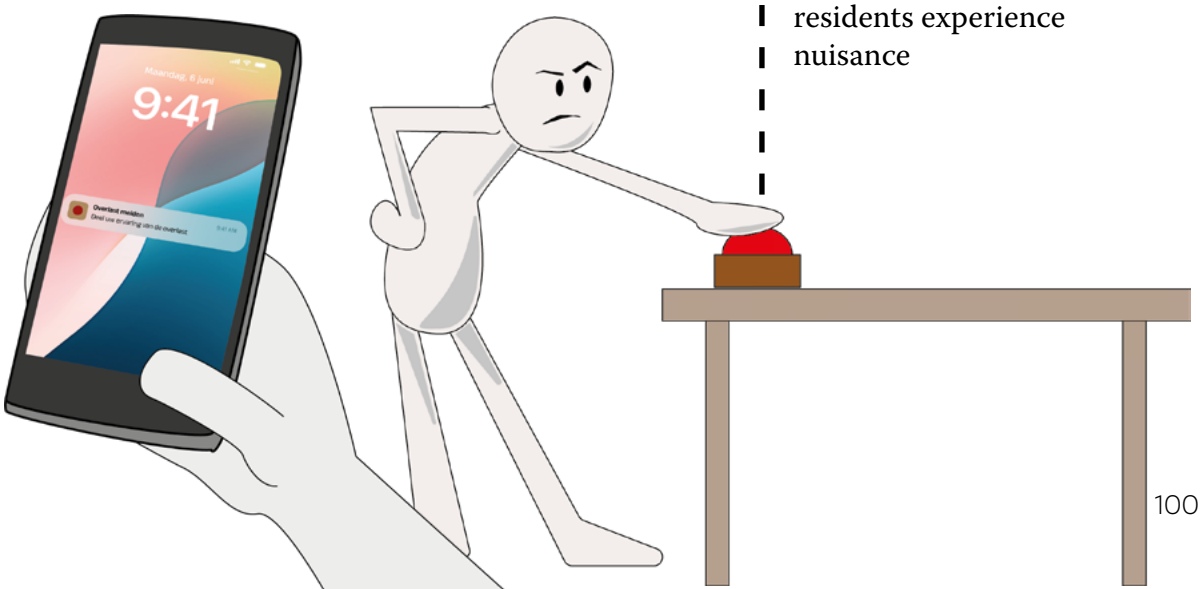


1 Survey

A questionnaire about the experience of nuisance due to vessel traffic

2 Nuisance Reporter

A big red button to press on whenever houseboat residents experience nuisance



Houseboat Resident's Needs

Interviews with houseboat residents conclude that they have the need for convenience, empowerment, trust and a frustration reliever. The design meets these values as described below.

Easy & quick

The survey consists of only three questions which can be quickly filled in

Empowering

The experiences of the houseboat residents are highlighted and analysed

Frustration Reliever

The nuisance reporter is a big red button to express frustration on

Trust

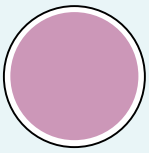
Houseboat residents are listened to when they experience nuisance

Data on Nuisance

The information that results from the reports is called 'Data on Nuisance'. In order to represent an evaluation that explains the experience of the houseboat residents the design meets the following criteria:

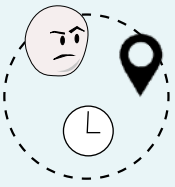
Environmental Conditions

The movements and sounds in the environment of the houseboat residents are measured with cheap sensors



Personalised

The houseboat residents create their personal account to report nuisance with. The results of the nuisance reports will be connected to the individuals



Identify Contextual factors

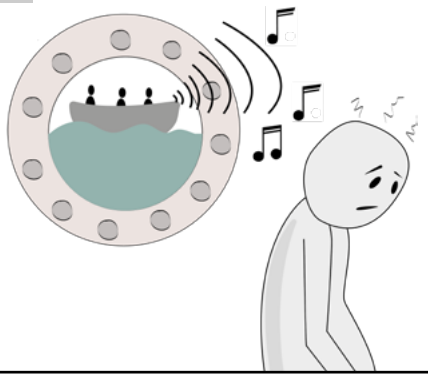
The location and time are monitored when pressing the button. The survey asks for more information of their experience

6.1.2

Storyboard

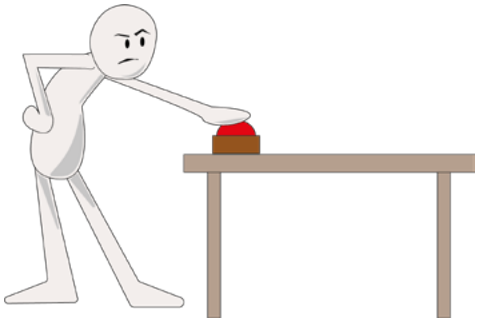
Houseboat resident's perspective

1



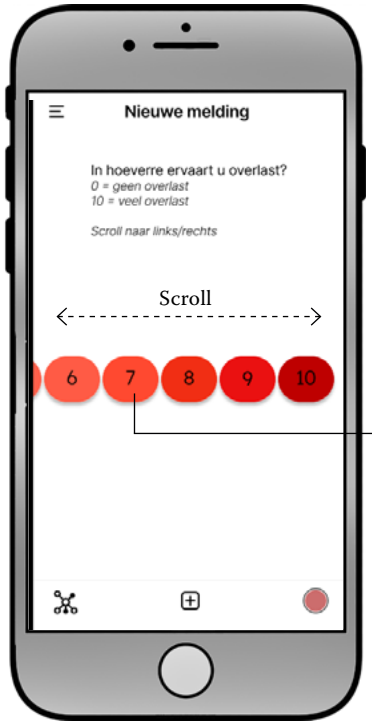
Max, the houseboat resident experiences nuisance caused by a boat with loud music

2



He presses the big red button to report nuisance

5



The level of nuisance is asked on a scale from 0 - 10. Max experiences nuisance at a level of 7

6

Max assigns that he experiences nuisance, because of the sound of the people on the boat

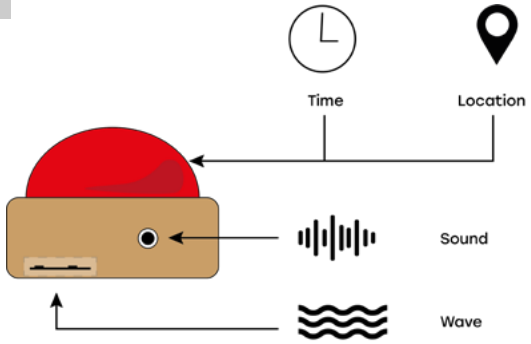
7

He chooses the type of boat that caused the nuisance: It was a tour boat

Scan the QR-code to try out the app in Figma

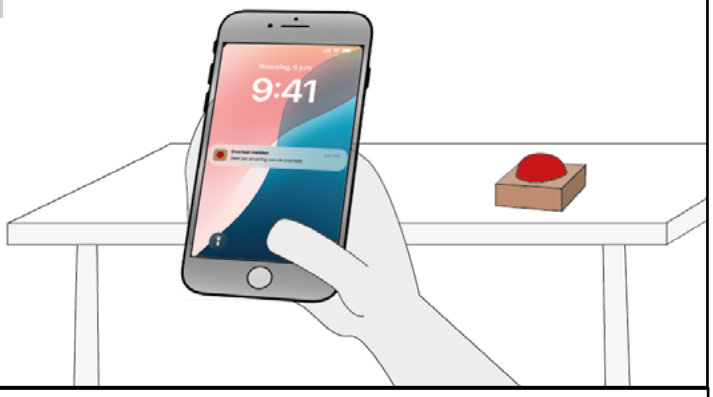
https://ap.lc/KskuJ

3



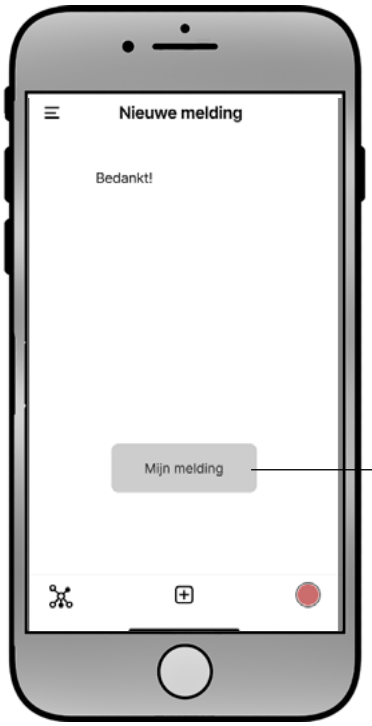
When Max pressed the button, it will save a minute of sound and wave measurements: 30 seconds before and 30 seconds after pressing the button

4



He receives a notification on his phone to share his experience of nuisance with the app ‘Overlast melder’

8



He is being thanked for the report. Now he can look at the results of his report

9

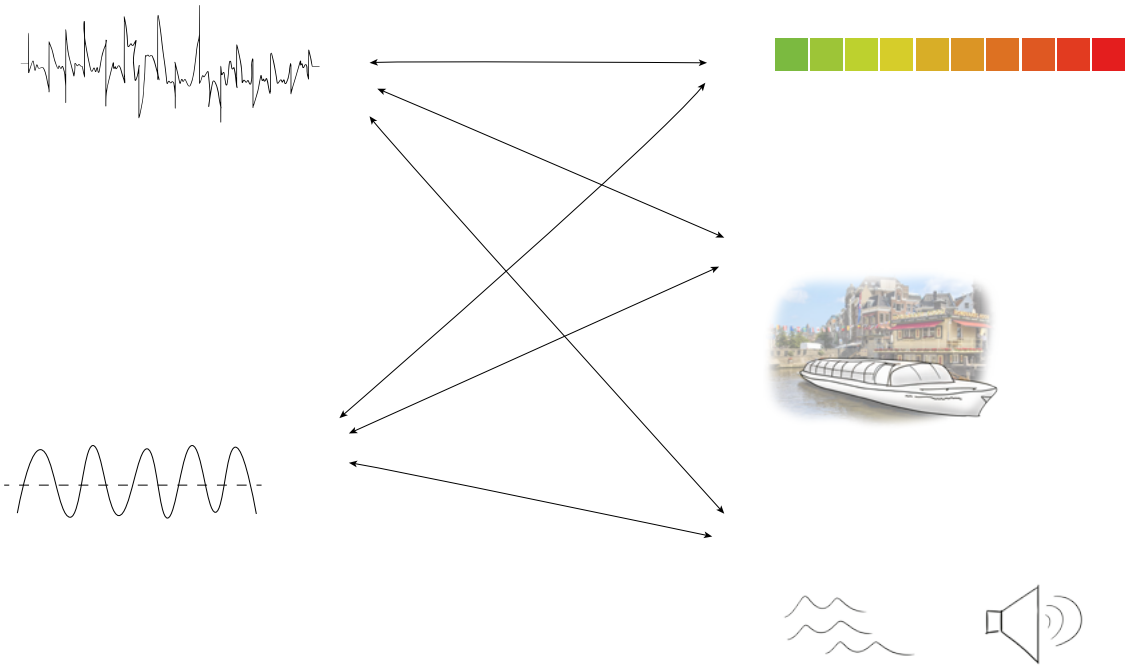
Storyboard

Researchers and
Policymakers' perspective

1

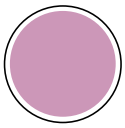
Researchers will be able to see the reports submitted by the houseboat residents

3



The objective measurements of the environmental conditions will be compared with the reported experience of nuisance. Can connections be established between these environmental conditions and the perceived nuisance?

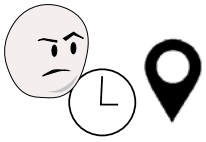
2



Houseboat resident N.1

Sound characteristics

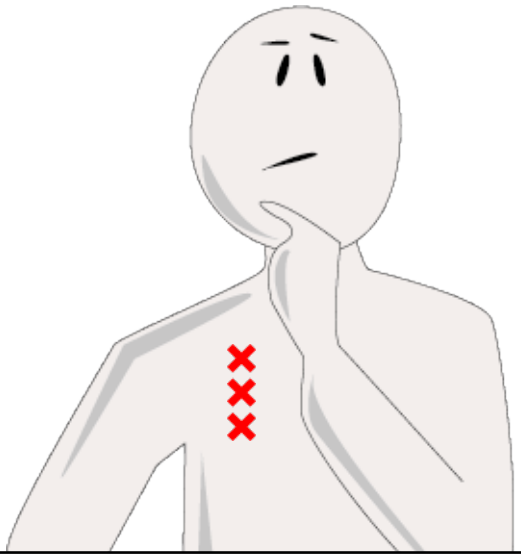
Wave characteristics



Contextual factors

The reports display the houseboat residents' details and experiences, as well as environmental conditions, location, and time

4



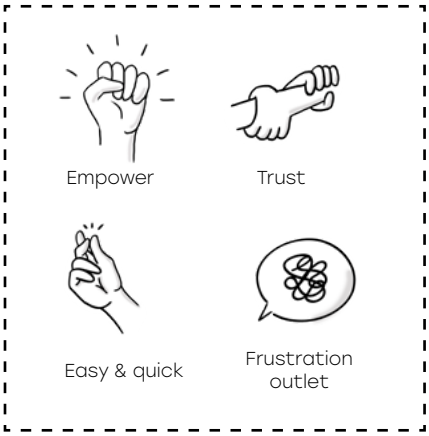
The research offers new insights into nuisance in the city of Amsterdam, enabling policymakers to make data-driven decisions. In terms of policy changes, this could mean adjusting regulations on vessel traffic.

The level of nuisance is highest where boats turn. The municipality could take action by regulating the traffic direction of the vessels and minimizing boat turns.

Example 1

Example 2

What if....Max is one of many houseboat residents experiencing nuisance due to tour boats? In that case, the municipality can investigate the impact of tour boats on the city.



Houseboat Residents

Report nuisance

Process of the data

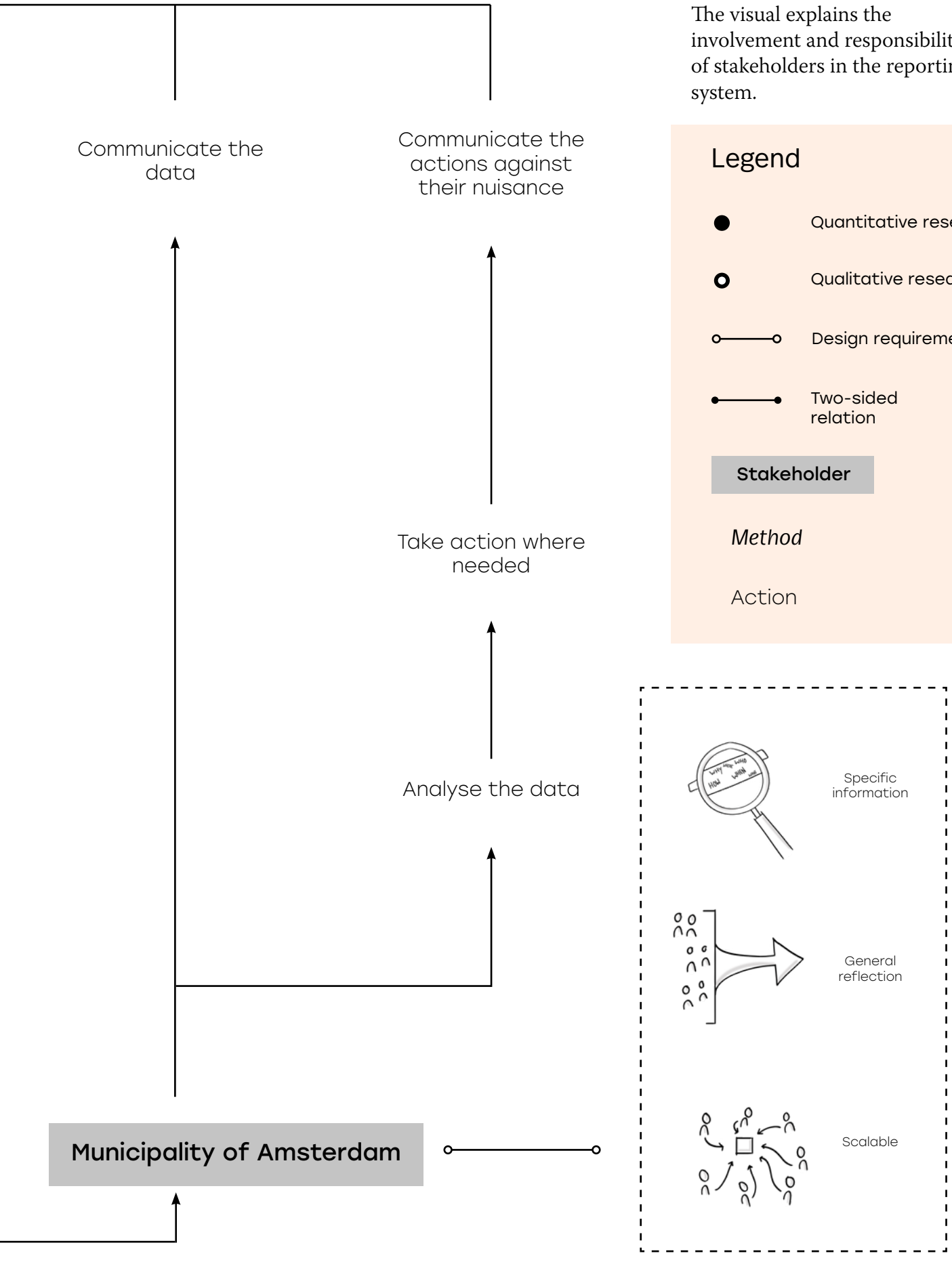
Why	When	Where	What	Who	How
Survey	Time tracking	Survey	• Sound sensor • Motion sensor • Survey	Survey	Survey

Researchers (MIT SAL)

Analyse & visualise data of sound and wave fluctuations → Research relation in quantitative and qualitative data → Analyse & visualise the cause and the level of nuisance

6.1.4 The Flowchart

The visual explains the involvement and responsibilities of stakeholders in the reporting system.



Prototype for Testing

Figure 56. ▶ Nuisance Reporter & Manual

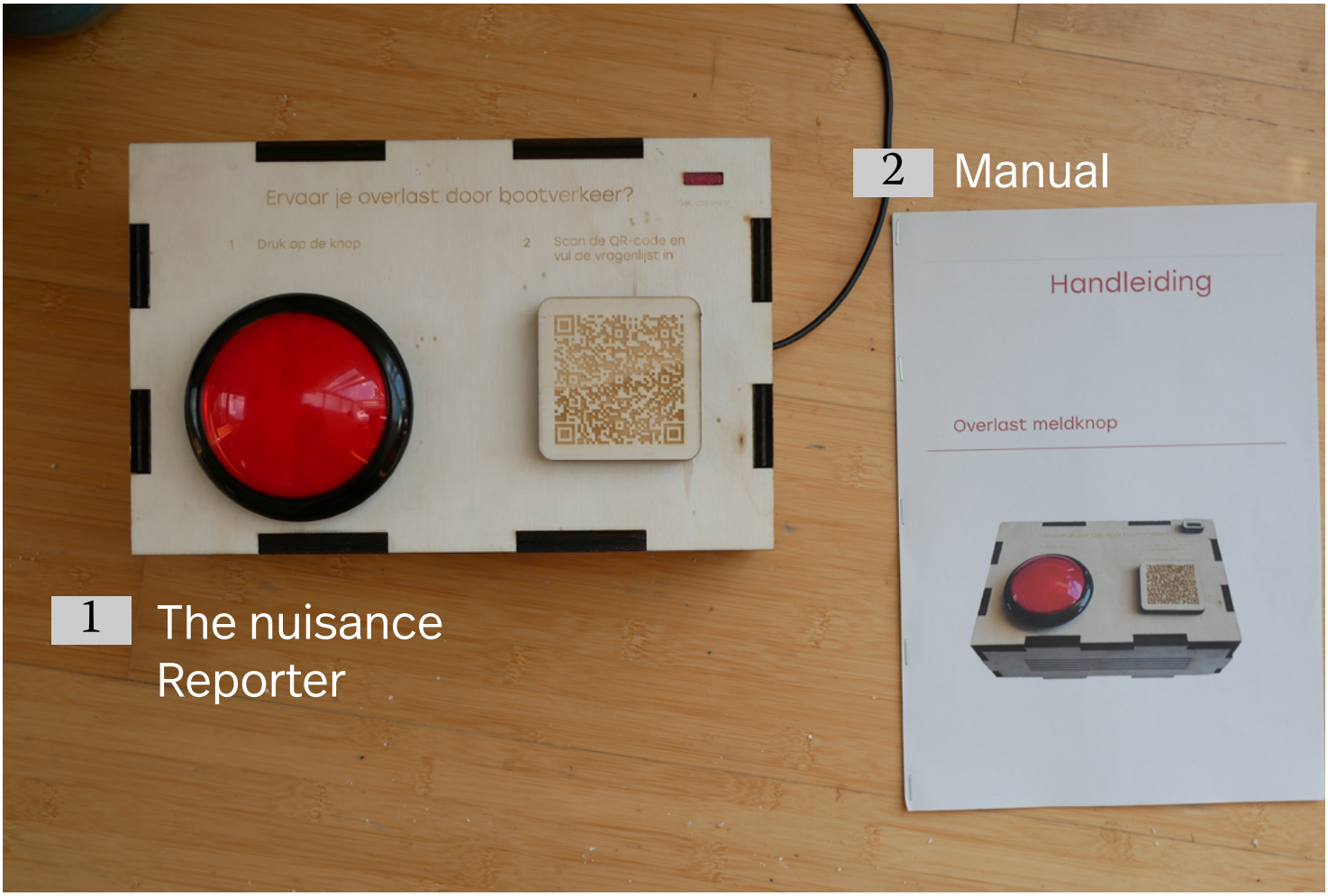
6.2

The prototype consists of three components.

1. **Nuisance Reporter**
   This box consists of a sound sensor, qr-code to the survey, and a big red button to report nuisance with.
2. **Manual**
   This little booklet explains all the steps that are needed for using the prototype in the right way. It also consists of a consent form and it explains the intention of the design
3. **Survey**
   The survey consists of six questions about the experience of nuisance.

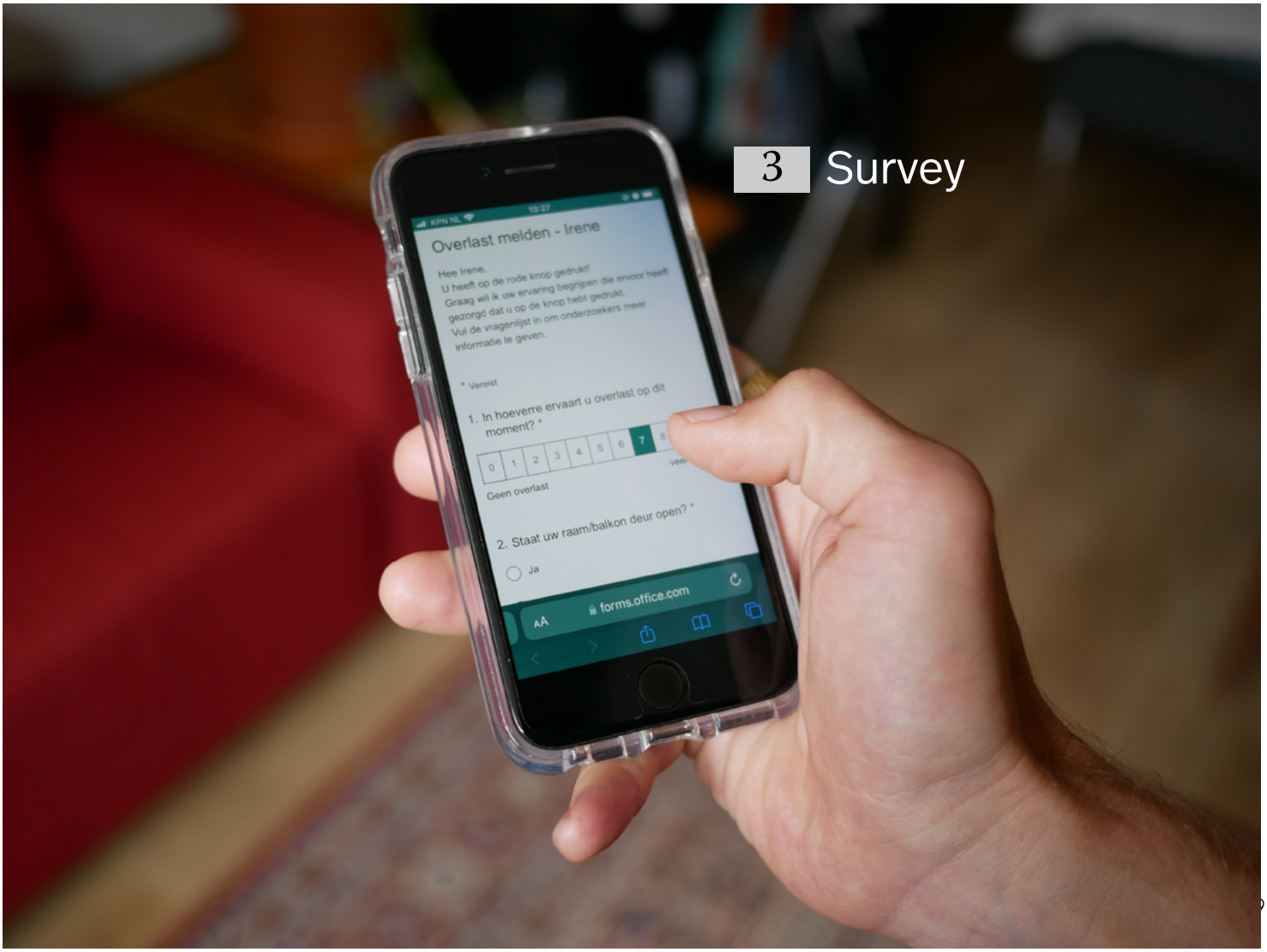
Figure 57. ▶ Survey on iPhone

This chapter will give all the details of the three components.



1 The nuisance Reporter

2 Manual



3 Survey

Nuisance Reporter

6.2.1

The Nuisance Reporter is a wooden, laser-cut box including a large red button, a QR code linking to the survey, and instructions for the two steps on the top of the box. Inside the box are the hardware components: a microphone and a Raspberry Pi that records sounds for one minute when the red button is pressed. The Raspberry Pi needs to be connected to a power source and is linked to the red button and the microphone via jumper wires.

Each participant in the test receives a unique laser-cut QR code leading to their personal survey. The text on top of the box guides participants to first press the button and then complete the survey.

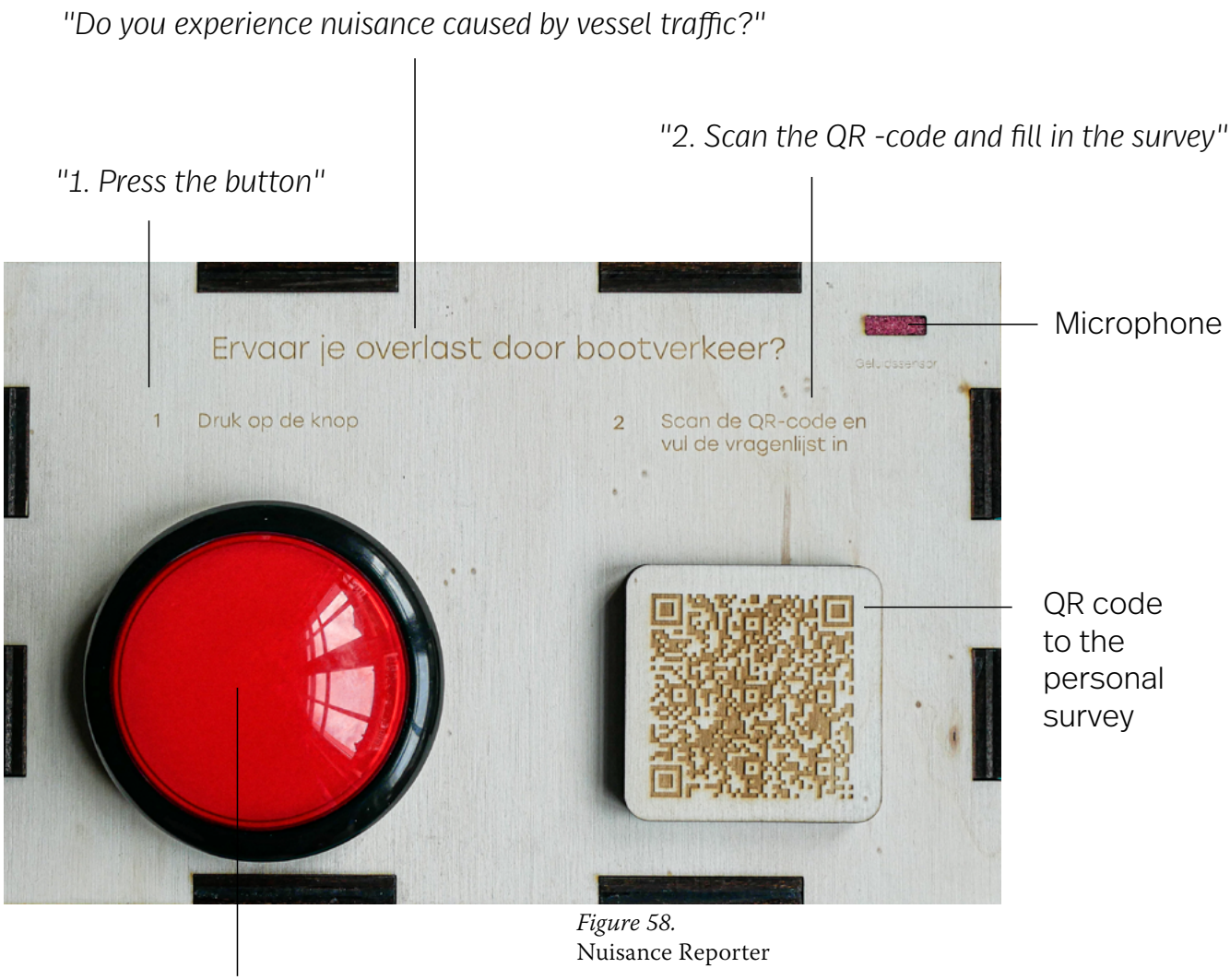


Figure 58.
Nuisance Reporter

Figure 60.
The Hardware

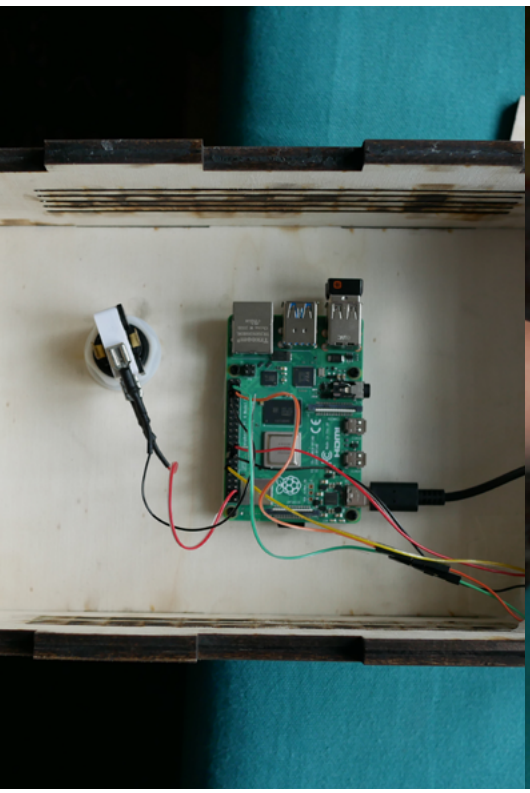


Figure 59.
Nuisance Reporter being used

Survey

6.2.2

The survey is a Microsoft Form that can be accessed via a link connected to the QR code. Figure 61 shows the questions included in the survey.
Participants fill out the survey using separate links, but the same questions are asked in each survey.
Participants should fill out the survey whenever they experience nuisance due to vessel traffic.

The survey consists of six questions about the experience of nuisance caused by vessel traffic:

1. **The level of nuisance**
   Participants rate the level of nuisance on a scale from 0 to 10, with 0 indicating no nuisance and 10 indicating a high level of nuisance.

2. **The state of the window/ door**
   It is important to know if the window or door is open or closed to accurately analyse the recorded sounds.

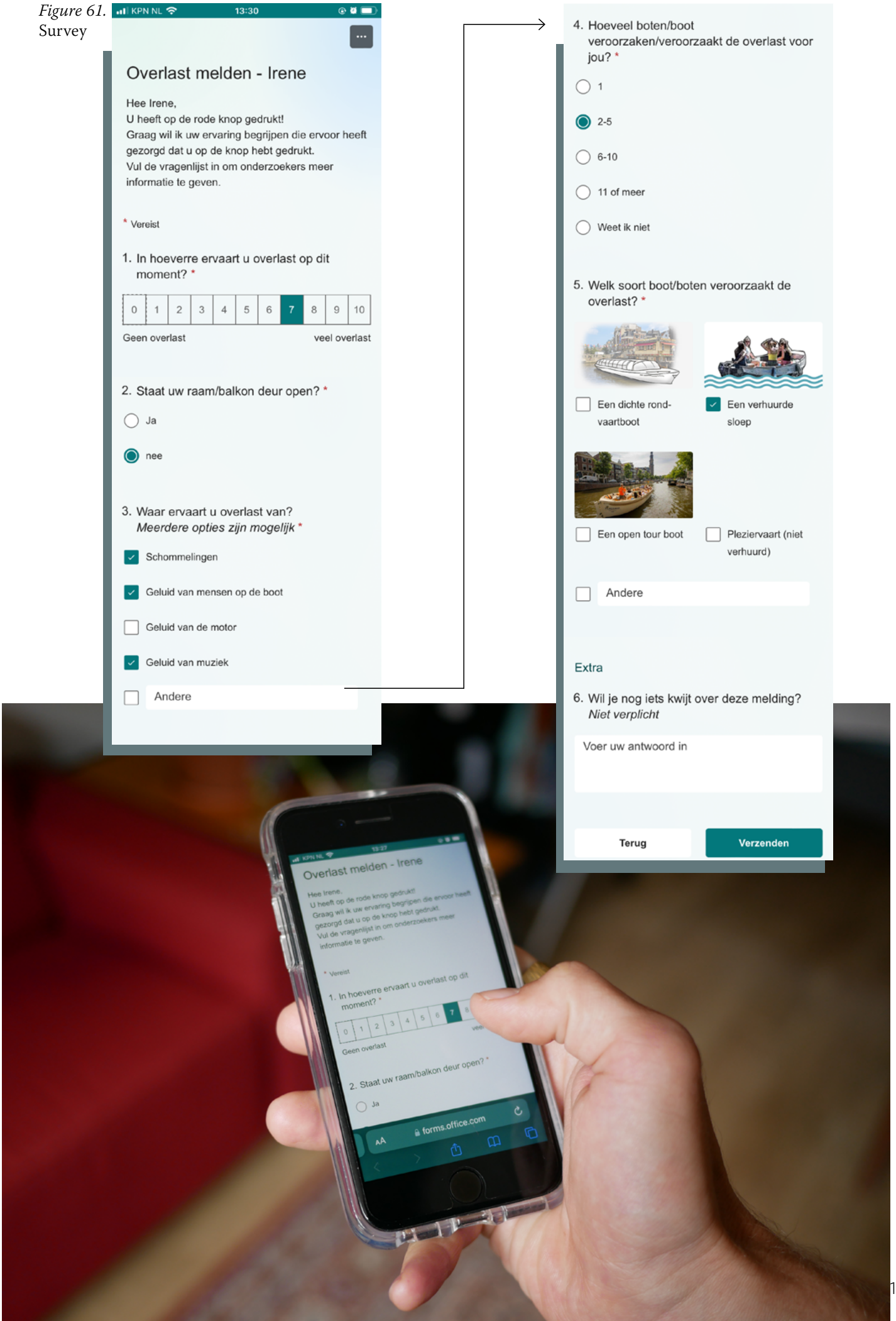
3. **The cause of nuisance**
   A multiple-choice question asks participants to assign the cause of the nuisance. Participants can select multiple options if needed.

4. **The amount of boats that cause the nuisance**
   A multiple-choice question asks participants to indicate the number of boats passing by that are causing the nuisance.

5. **The type of boat**
   A multiple-choice question, including pictures of different boat types, is asked. Participants can select multiple options if needed.

6. **Extra information**
   Participants have the option to provide additional information about the report if they wish.

Figure 61. Survey



Manual

6.2.3

The manual helps participants of the *'Three-Day Prototype Test'* understand how to use the prototype by providing instructions and additional information. This manual is sent to them before delivering the prototype and is also explained during its installation in their homes. It consists of the following sections:

- **Test Plan**
  This section outlines what is expected of the houseboat residents during the test. A visual representation illustrates the steps they should follow if they experience nuisance due to vessel traffic.

- **Prototype Details**
  This section explains the components of the prototype, including a photo with descriptions of its parts.

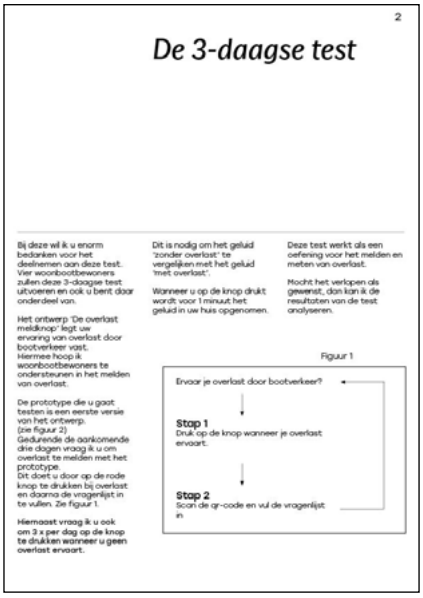
- **Hardware**
  The term "hardware" is defined, and participants are given the option to choose how they would like their data to be analysed. They can select from two different options.

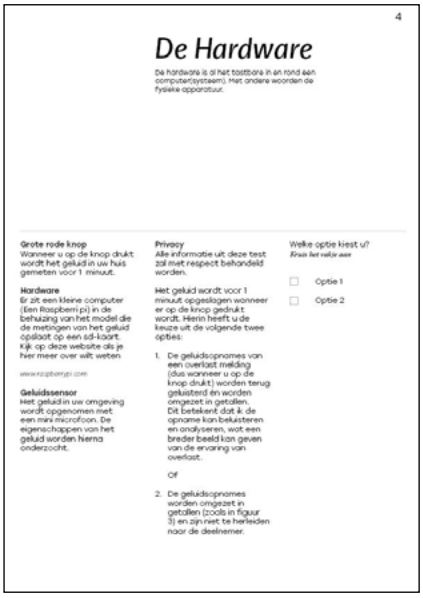
- **Storyboard of the Design**
  The prototype is the first model based on the ideal design of nuiSENSE. To provide more context about the design's intent, this section explains it using a storyboard.

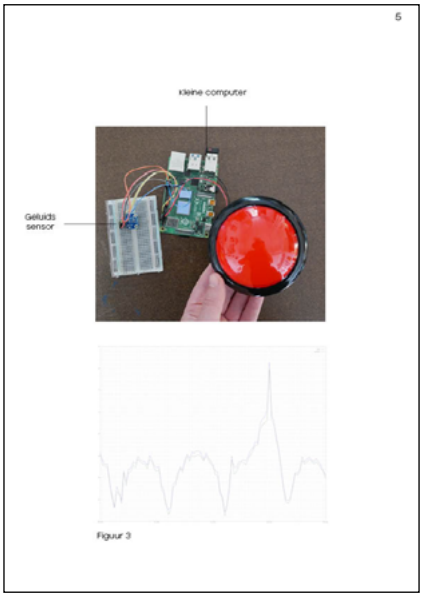
- **Consent Form**
  Participants are required to read and complete the consent form before beginning the *'Three-Day Prototype Test'*.

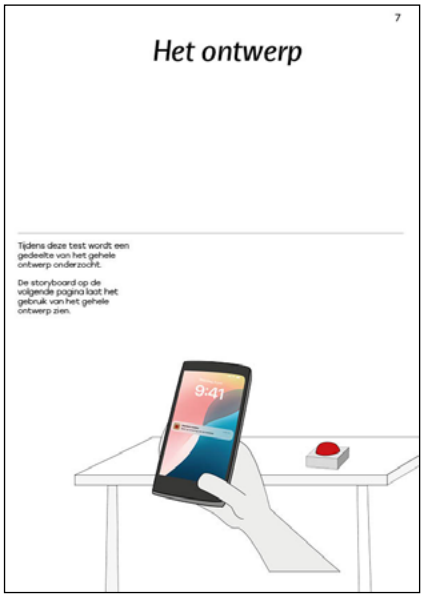
Participants will keep the manual throughout the test, allowing them to refer to it if they have any questions or are unsure of what to do. They can always contact me if they have any doubts. See Appendix D for the full manual including the consent form.

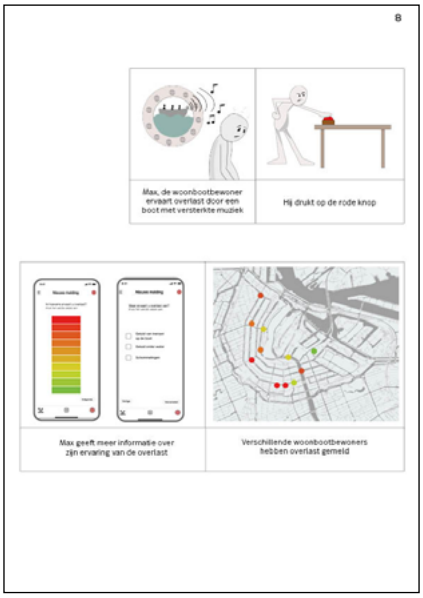
Figure 62.
Manual pages

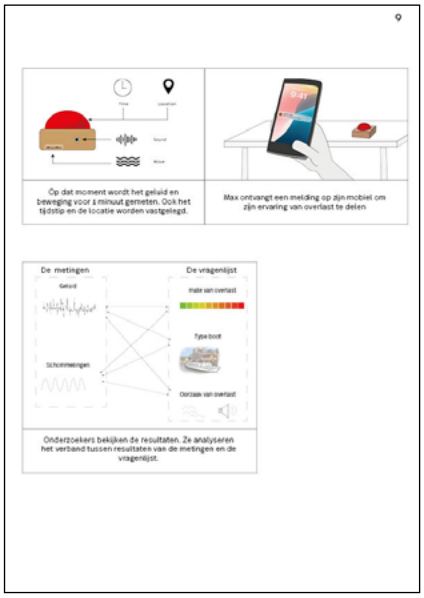












Visualisation of Nuisance Data

6.3

The data of nuisance of one participant of the '*Three-Day Prototype Test'* is presented in this chapter. The visualisation shows the following data:

- **Participant's Details**
  The participant's age, gender, location, and the time of the reports are shown.

- **Level of nuisance**
  The level of nuisance is measured on a scale from 0 to 10, which is represented by a colour gradient ranging from green to red. Both the average level of nuisance and the range (minimum and maximum levels assigned) are shown.

- **Reporting Time**
  The times of the reports over the three days are visualized. The corresponding nuisance levels are colour-coded according to the green-to-red scale.

- **Amount of boats**
  A pie chart shows the percentage distribution of selected options indicating the number of boats causing the nuisance.

- **Type of Boat**
  A pie chart displays the percentage of times each type of boat was reported as causing nuisance. This data was gathered through a multiple-choice question with the option to select more than one answer.

- **Reason for Nuisance**
  Another pie chart shows the percentage distribution of reasons given for the nuisance, based on a multiple-choice question with the possibility of selecting multiple answers.

- **Plot Spectrum**
  The graph displays the frequency of sounds recorded by the participants in Audacity. I selected specific sounds caused by vessel traffic, identified as nuisances, and plotted them on a spectrogram, which is a visual representation of the spectrum of frequencies. The plots show how the energy or amplitude of different frequencies is distributed within that segment.
  The vertical axis represents the strength of the frequencies, and the horizontal axis represents the frequency.
  The sound of nuisance, such as engine noise are compared with recordings of silence to highlight the difference.

Participant 1

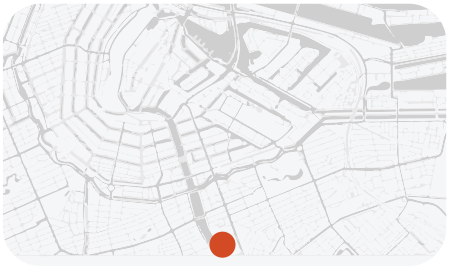
6.3.1

Gender **Female**

Age **67**

Amount of reports **14**

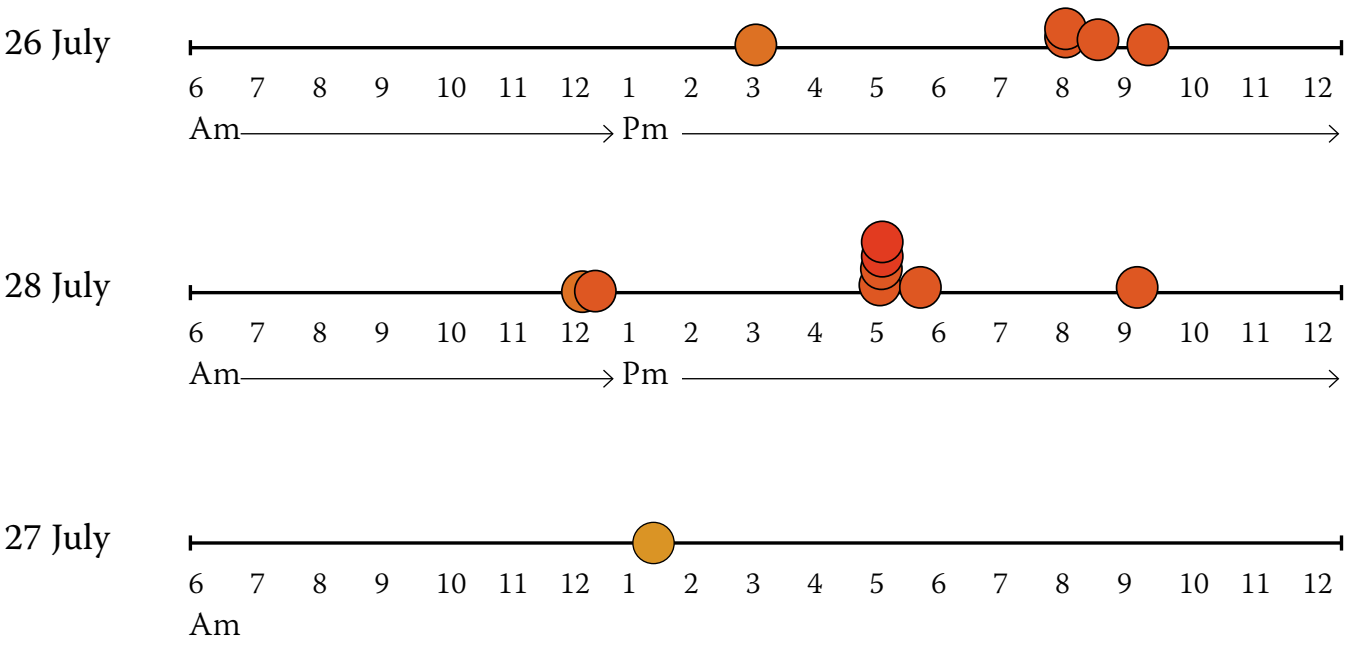
Dates **26,27,28 July (weekend)**



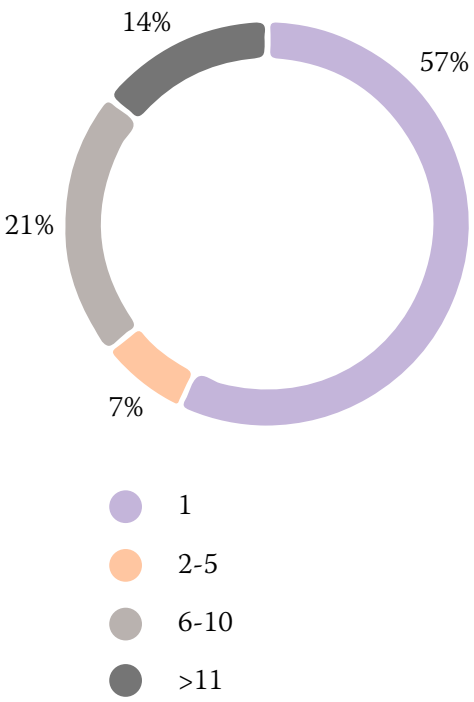
The survey

Average nuisance

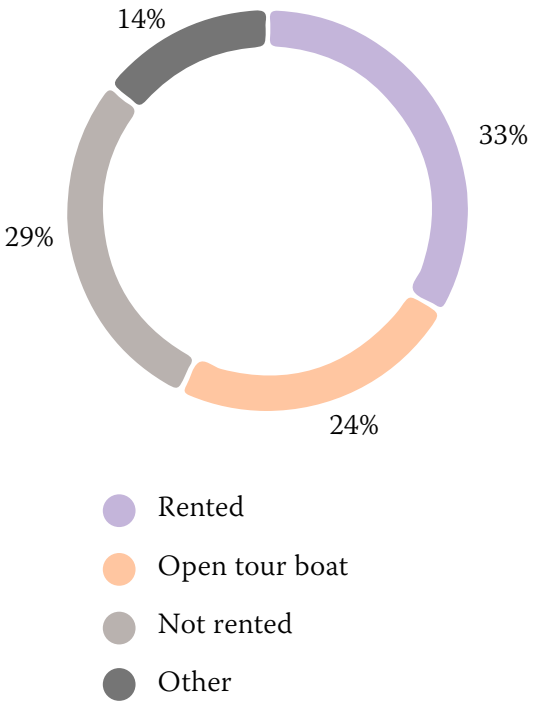
Nuisance range



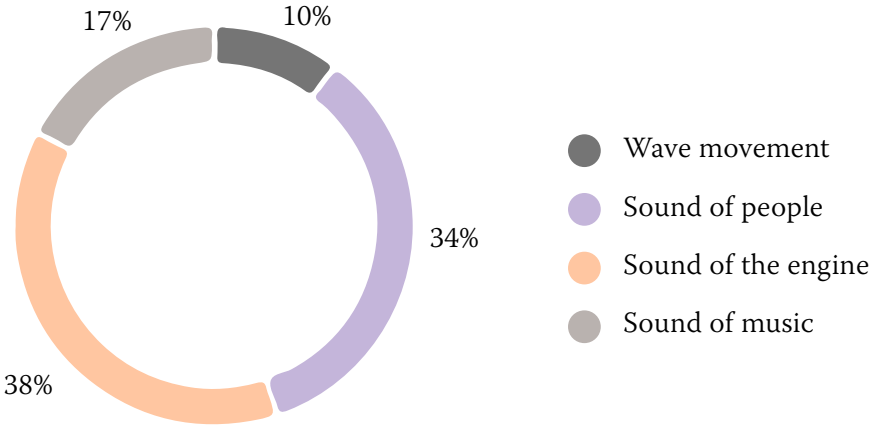
The amount of boats



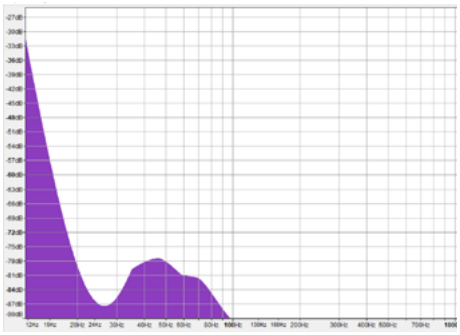
Type of boat



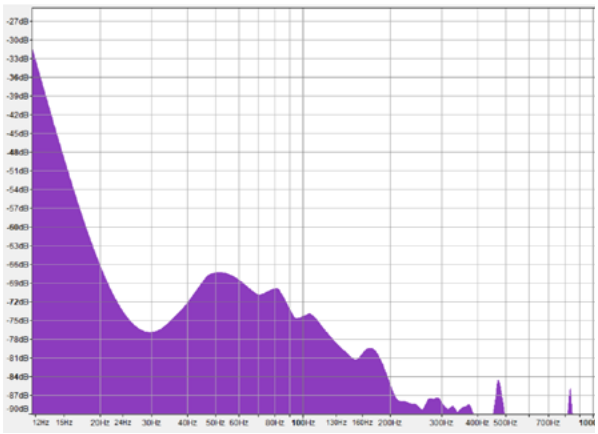
Reason for nuisance



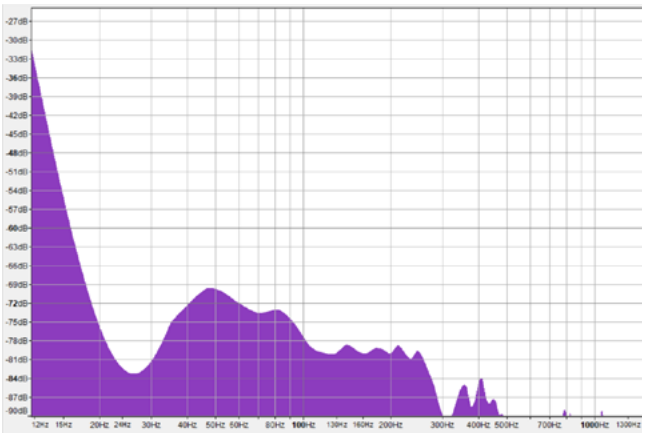
The sound sensor
(Plot spectrum in Audacity)



Silence



Sound of the engine



Sound of people & music

Evaluation

7

The evaluation of the design will be described in this chapter. First, the insights gathered during the prototyping phase will be presented in Section 1. This will be followed by Section 2, which details the assessment of the prototype by four houseboat residents. It explains what aspects of the design should be adjusted to better reflect their experience of nuisance and what is needed to satisfy the needs of the houseboat residents.


KPN NL
13:27
Overlast melden - Irene
Hee Irene,
U heeft op de rode knop gedrukt!
Graag wil ik uw ervaring begrijpen die ervoor heeft gezorgd dat u op de knop hebt gedrukt.
Vul de vragenlijst in om onderzoekers meer informatie te geven.
* Vereist
1. In hoeverre ervaart u overlast op dit moment? *
0 1 2 3 4 5 6 7
Geen overlast
2. Staat uw raam/balkon deur open? *
Ja
forms.office.com
AA

Insights from Prototyping

7.1

Before testing
While developing the prototype from the initial design 'nuiSENSE', several decisions had to be made for different component. This chapter shows the decisions for the different components of the prototypes made before, while and after the '*Three-Day Prototype Test'*.

Nuisance Reporter
This component was made by creating hardware, software and housing. This is what I learned from prototyping the Nuisance Reporter:

1. The microphone needs protection, such as foam, that does not affect sound quality.
2. The button should be compatible with 5V.
3. The box should have an accessible opening to remove the Raspberry Pi for transferring sound data.
4. Sufficient space is needed for electrical connections.
5. The prototype must differentiate between nuisance sounds and non-nuisance sounds.
6. The QR code should be easily attachable for use by different users.

Survey

1. The survey should include multiple-choice questions for quicker completion.
2. Each participant should receive a unique survey link to make it personal.
3. Photos of different boat types should be included to clarify questions.
4. It is important to know if windows or doors are open to understand the context when recording sounds.
5. The nuisance can be caused by multiple or just one boat passing by, therefore the survey should ask for the amount of boats that cause the nuisance.

Manual

1. Describe the components of the design to make the design understandable.
2. Provide users with options for analysing the sound data. This encourages them to consider what they find acceptable and makes them feel secure.
3. Be transparent about how their input will be used.
4. Use simple language and visual aids to explain complex design aspects.

While testing
Several observations were made during testing:

1. One participant could not report nuisance because he avoided the area of disturbance. When nuisance levels became too high, the participant chose to leave rather than stay and report.
2. The timing of reporting significantly impacts the test results; reports made during the weekend were more valuable than those made during the week.
3. QR codes proved ineffective; participants preferred receiving links via WhatsApp.

After testing
By visualising the results that came out of the *'Three-Day Prototype Test',* I came to new insights about the design requirements:

1. Measuring the decibel levels of boats from inside the houseboat was ineffective due to dominant internal sounds, which overshadowed

external noises. Identifying specific external sounds was challenging due to overlapping internal activities like talking, cursing, and cooking.

2. Listening to the sound recordings while reviewing survey results helped in identifying the source of nuisance. Full recordings, if privacy issues are addressed, may provide a better understanding of the environment.
3. The time frame of reports revealed interesting patterns in nuisance occurrences, highlighting significant differences in reporting between houseboat residents.
4. The absolute number of nuisance experiences provides an indication but does not fully capture the experience. Using colour codes to describe the level of nuisance helped convey the intensity more effectively.

Houseboat Residents' Evaluation

7.2

This chapter presents the results of the Interview Evaluation described in Section 7 of Chapter 3.
First, it will showcase the houseboat residents' opinions on the 'Data on Nuisance' which refers to the data collected during the *'Three-Day Prototype Test'.*
In the second part, Houseboat Residents' Needs, the results of the Interview Evaluation will be presented by displaying the average ratings of agreement with the statements, see figure 63. Quotes from the interview are included to support the insights.
For some answers, only the evaluation of three participants will be shown, because the fourth was not able to answer the questions, because the participant only reported one time.

Before diving into the details of the results, a summary of the general insights will be provided.

Houseboat residents' Needs

See Section 2 of Chapter 5 for the details on the houseboat residents' needs for the design. This parts addresses the following question:
Which needs of the houseboat residents are unmet and fulfilled by the design, according to the residents?

Creating Awareness
The design is effective in providing a sense of support and relieving tension after reporting nuisance. However, it does not completely solve the problem of nuisance, as this depends on the involvement of policymakers. The awareness and actions of policymakers influence the trust of houseboat residents in the design.

Transparency of Documentation
The residents want to know what they have reported in order to believe that it supports their story.

Simultaneous Actions
While the questionnaire was clear and quick to complete, participants still felt stressed when reporting nuisance. This was because they had to perform multiple tasks simultaneously, such as analysing the passing boat and reporting the nuisance. However, the alertness required to report accurately also contributes to a sense of accomplishment and empowerment. A balance must be found between challenging the residents and promoting mindfulness.

Frustration Reliever
The large red button served as an effective frustration reliever.

Identifying the Causer
Residents want the ability to identify the boat driver or company responsible for the nuisance so they can report incidents to the municipality if necessary. In the current design, houseboat residents indicate the type of boat causing the nuisance. However, they need photographic proof to confirm that this particular boat was responsible.

Data on Nuisance
See Section 3 of Chapter 7 for the details of the design requirements for the Data on Nuisance by the design.

This parts addresses the following question:
Does the design evaluate the full experience of nuisance according to the houseboat residents?

Accessibility of the Design
Results indicate that the evaluation accuracy increases when the design is close to the user. Users need to see the boats causing the nuisance while reporting. Depending on the type of boat, users may or may not see them from inside. When the design is positioned indoors, users have to move in or out to report nuisance.

The Constancy of Nuisance
Nuisance limits are caused by accumulated noise or wave conditions. It would be interesting to measure the duration of nuisance rather than only a single moment of disturbance. This way we will be informed how the nuisance is build up.

Safety and Privacy
Results show that nuisance levels are influenced by the proximity of boats, which affects the privacy of houseboat residents. They may feel unsafe due to the possibility of boats intruding into their space.

Sensitivity
Past experiences affect how houseboat residents perceive nuisance, and sensitivity varies among individuals. The tool should measure this sensitivity to provide a comprehensive overview of nuisance experiences. Sensitivity influences how environmental conditions are perceived. Understanding shared and differing sensitivities to environmental conditions is crucial for understanding city life experiences.

Boat specifics
We want to know what about the certain types of boat traffic is annoying. The survey now only asks the type of boat, but the amount of people on the boat also has influence on their perception of nuisance.

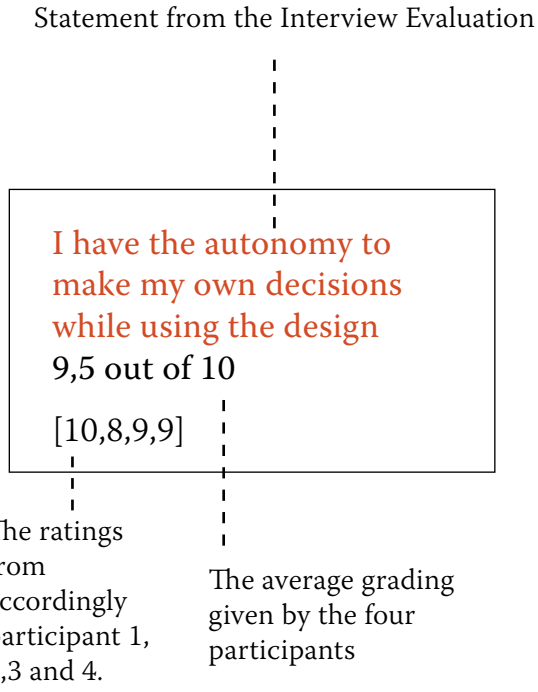


Figure 63.
Rating of agreements with the statement

Assessing 'Nuisance on Data'

7.2.1

The moment of reporting nuisance
The houseboat residents report nuisance when they are frustrated due to vessel traffic. However, Participant 3 explains that she sometimes doubts on reporting nuisance or not.

"Today, I felt like pressing the button, but it turned out to be a water management boat. So, I didn't press it because I thought they're just doing their job." (Participant 3)

Besides, the distance of the design and the houseboat resident was sometimes not convenient. When being outside the resident need to go inside again to report nuisance.

The QR code on the prototype could be easily disattached so I could switch the QR codes when the prototype was moved to another participant. However, participant 3 used this to be able to report nuisance wherever she was. (See figure 64)

The survey
According to the participants of the *'Three-Day Prototype Test',* the survey evaluated the important aspects of the experience. However, several factors for nuisance were missing.

Participant 1
A question about the amount of people on the boat is missing in survey.

"The options for causes of nuisance fall within the experience. However, there is missing information about the specifications of the boat: specify the number of people on the boat."

Participant 2
Details of the weather and the distance to the boat driver is missing.

"If the weather is nice, it's busy. If it rains, there's no one around. The distance is crucial for the feeling of privacy. That's my domain. A distance of about 2 or 2.5 meters is too close"

Participant 3
A baseline measurement of annoyance in people is needed.

"It's not just one moment that causes disturbance, but an unconscious accumulation of irritating moments. This is something we also discussed during our first conversation: if you've experienced something, it affects your perception of disturbance. Your tolerance level is different. A baseline measurement of annoyance in people helps you understand how 'fresh' the person is."

Figure 64. Disattached QR code

Assessing 'Empowerment'

7.2.2

The design makes the houseboat residents more aware of their experience, they feel supported by the results of the design and they feel that they finally can do something with their frustration. The big red button gives them this feeling of support, because it reflects their limit.

However, the involvement of the government is crucial for them to feel supported by the design. Besides, they desire the boat drivers to become aware of the data as well. Moreover, they want to see what is being measured in order to feel in control.

The design helps me communicate my experience of nuisance to policymakers

9 out of 10
[10,8,9,9]

Participant 1
"There are still details missing. How long is a minute? When does the recording stop? Because of this, I feel less control. There's a missing moment regarding when the recording was made. I want to make a good recording. I want it to be perceived well, and I want to know how it is perceived."

Participant 2
"Yes, I feel that I have become more aware, and that is always the first step. But I have no control over the boats that cause disturbance."

I have the autonomy to make my own decisions while using the design

9,5 out of 10
[10,8,10,10]

Participant 4
"I have the full autonomy. I press the button when needed and provide an explanation based on how I see it."

The design gives me control over the problem

6,5 out of 10
[7,0,10,9]

Participant 2
"It provides evidence and results about what is happening. The data collected offers the opportunity to develop policies. It makes it specific: it provides qualitative evidence. It is location-bound and time-bound. If it is recorded as I experience it, then it becomes an argument for noise disturbance. However, there are quite a few boats that are not aware of this. If this can be shared, it would be very effective. Show the footprint on the water. What do you leave behind? Make that a topic of discussion."

Assessing 'Trust' in the design

7.2.3

The houseboat residents trust the effectiveness of the design. However awareness of the municipality of Amsterdam is needed in order to make them trust the prototype. And having a device recording their environment wants them to know what is exactly being recorded and analysed.

The design will ensure that the nuisance will decrease in the future

9 out of 10
[10,9,8]

Participant 1
"What I still miss is certainty that it reaches the right place and confirmation on whether or not something will be done with it."

Participant 3
"It all depends on the policymakers, but if they took it seriously, it could work well. I want feedback when a broader picture of disturbance has been formed, for example after six months. And to show what the main problem areas are."

The design is created for my benefit

10 out of 10
[10,10,10,10]

Participant 2
"The button makes me very aware of the moment of disturbance: that's a challenge. The questionnaire helps me reflect on the moment. It provides me with more information about my experience. For the first time, there is interest in my experience."

Participant 4
"I can channel my frustration into it and operate it autonomously. That it is physically present."

The design handles the report fairly

3,25 out of 10
[0,10,3,0]

By handling the report fairly, we mean the system's approach to analysing data on nuisance. When the design reports fairly, it implies that the data gathered by the design is treated with respect.

Participant 3
"If you have a device in your house, that's quite something. I'm not sure if I would want such a device from the municipality in my home. But having it outside or on the water could be fine."

Participant 2
"I don't know the honesty of the design at the moment because I'm not sure to what extent the municipality will address this. I want to know what will be done with it. I find that important; otherwise, I'm just pressing the button. What happens then?"

Assessing 'Convenience'

7.2.4

The survey is quick and easy to fill in. However, the design currently asks for alertness of the houseboat residents and too much happens at the same time. They desire for a report that reflects their experience which asks for time management and they need to be near the device.

Figure 65 shows the location of the prototype at the houseboat of participant 3. The participant could not see the boats that well from this position, which made it hard for the participant to report nuisance.
They want to record the nuisance immediately when the boat passes by.

The design is easy to use

7,3 out of 10
[5,7,10]

Participant 1
"I need to be quick, otherwise the boat will pass by. You have to really care about it. It has to be done very quickly; it's especially important to be on time."

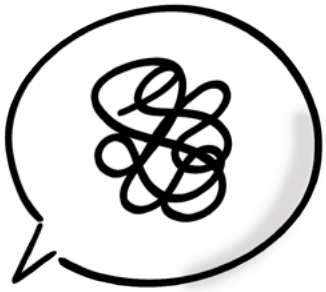
Participant 3
"When I'm nearby the design, it's convenient. A mobile phone is the easiest."

Participant 2
"I find it challenging to locate the QR code on my mobile. An app on my phone would be fine, but I consider a box with a button, a microphone, or other sensors that record the information to be more straightforward. It's more transparent. It's from here and not beyond."

Participant 4
"It's good, it can be quick. But still, because you search on your app and a lot happens. It gets in the way of each other."

Figure 65. The prototype at the home of participant 3

Assessing 'Release of Frustration'



7.2.5

Before reporting nuisance the houseboat residents feel irritated, angry about the noise of the nuisance due to vessel traffic.
After reporting they explain to feel triumphant, happy and like a burden being lifted.

Participant 1
"I was very happy—yay, I was able to do something about it. I also found it enjoyable. It's like a kind of designer box."

Participant 2
"It's unfortunate that we have to press the button, but it's worth doing IF something is going to be done about it."

Participant 3
"Something is happening, and I can do something about it. And it's more accessible than, for example, calling water management. You don't have to talk to someone. It takes less time."

Participant 4
"It is a relief; I have been able to do something, and hopefully, something will be done with it."

Reflection

8

This chapter summarizes the main insights gained from the research, describes the implications of the research, reflects on the methodologies used, and delves into my own learning points.

Main Insights

8.1

The experience of nuisance cannot solely be measured by environmental conditions, as the perspective of residents is crucial to consider. Therefore, the noise maps described in the introduction are not sufficient for fully measuring the perception of nuisance.
This research demonstrates the implementation of a reporting tool with the involvement of residents when measuring environmental nuisance through a case study.

The results of this research show that, for houseboat residents, the nuisance is caused by waves and noise due to vessel traffic. However, the level of nuisance is not only determined by these environmental conditions, as each person perceives their environment differently. Past experiences of houseboat residents influence their current perceptions, and not being able to see the source of the nuisance also affects how it is experienced.
Moreover, the nuisance depends not only on environmental conditions and contextual factors but also on trust in the process—whether residents believe that something will be done to address the nuisance. This confirms Haggett's statement that "Noise is something that is 'experienced' rather than just 'heard.'" (Haggett, 2012)

As the goal of this research is to develop new methodologies for measuring residents' perception of their environment, the prototype of 'nuiSENSE' was created. The design successfully gathers new information on the nuisance caused by vessel traffic. The design process reveals results for two important components: the needs of houseboat residents when reporting nuisance, referred to as 'Houseboat Residents' Needs,' and the data gathered by the design, referred to as 'Data on Nuisance.'
The main insights from these two components of the design are explained in this section.

Houseboat Residents' Needs

Conducting 8 interviews with houseboat residents provided new information on the needs of houseboat residents when experiencing and reporting nuisance due to vessel traffic in Amsterdam. The research shows houseboat residents' need for convenience, an outlet for frustration, trust in the process, and a feeling of empowerment.

Convenience
The results show houseboat residents' need for convenience when reporting nuisance, as they prefer not to focus on the nuisance for too long.
To make reporting easier, it would be helpful if simultaneous actions while reporting nuisance were minimized.

Frustration Outlet
Houseboat residents are frustrated when experiencing nuisance and have the need to express their emotions.
The prototype successfully provides an outlet for their frustration, which in turn makes them feel empowered.

Trust in the Process
Moreover, for the design to work, residents need to trust that something will be done with their report, for which transparency in the process of information is crucial.

Empowerment
Houseboat residents want to feel supported by the design and have control over the nuisance problem.
Testing the prototype shows that houseboat residents want policymakers and boat drivers to be made aware of the issue.
While the prototype gives control to houseboat residents, they still feel powerless in a way because the design depends on the input of policymakers.

Data on Nuisance
Testing the prototype provided new data on the perception of nuisance, which is visualized for one houseboat resident (see Section 6.2.1).
This data was influenced by the accessibility of the design and confirms, as stated in the introduction, that measuring the full experience of nuisance is challenging.

Accessibility of the Design
The accessibility of the design influenced the data gathered on nuisance. If the design is close to the user when experiencing nuisance, the likelihood of reporting nuisance is higher.

The Difficulty of Evaluating Nuisance
While the data on nuisance obtained from testing the prototype is valuable, the design did not account for all the important factors that influence houseboat residents' experience of nuisance.
Factors like the feeling of safety, sensitivity to noise, past experiences, and specifics of the boat were missing, according to houseboat residents.
Moreover, the tool gathered information on a certain moment of nuisance, while their nuisance builds up over time until a certain limit is reached.

To conclude, this research shows the importance of, as well as the approach for, measuring the experience of nuisance with active involvement from residents. 'nuiSENSE' was developed for the case study, which highlights the criteria for houseboat residents' needs when reporting nuisance, as well as the criteria for the data on nuisance needed by policymakers and researchers.

Implications

8.2

This research demonstrates how to effectively measure residents' perceptions of their environment and highlights what is important to residents when informing researchers and policymakers. It serves as a guiding tool for policymakers and researchers to implement methods that capture residents' perceptions in urban areas, which is in contrast with much of the existing research in the EU, where the nuisance is assessed using only measurements of environmental conditions, without incorporating residents' experiences of the environment.

The study illustrates how to successfully carry out a project that requires resident involvement, contributing to the optimization of residents' well-being. The methods used in this research gained trust of the residents to participate in this research and the results of the analysis of the context are translated into a working sensing tool.
The findings on nuisance created by the design offer new insights into the experience of nuisance in the city, offering policymakers valuable insights to better understand residents' experience of nuisance.
However, it is important to note that this research specifically focuses on houseboat residents. Different challenges may arise when applying a similar design to other target groups. Still, this research acts as a useful example of conducting urban studies with and for residents, providing guidance for future projects.

Future Research Opportunities

8.3

The findings from the creation and testing of 'nuiSENSE' demonstrate that while the tool successfully addressed many of the goals outlined in the introduction, such as empowering residents, several areas require further refinement. There are different components of the design that need finalisation. These vary from the fit into the context to the evaluation of nuisance.

Identification of Boat Type
The identification of boat types needs to be more specific. Identifying the boats can make the process of reporting for houseboat residents quicker. The boats can be identified by their sounds and cameras, which requires further research.

Accessibility of the design
An outcome of the evaluation was that houseboat residents need to be near the design to report nuisance. Improving the accessibility for multiple users can make the data on nuisance more reliable.

Identifying the Feeling of Safety
Nuisance caused by vessel traffic increases when boats come too close to houseboat residents, making them feel unsafe. Researching methods to assess the feeling of safety would therefore be valuable.

Create Awareness
The data from the design should raise awareness among policymakers and boat drivers. Collaborating with the Municipality of Amsterdam to research data representation would make them more aware of the issue.

Measuring the Build-up of Nuisance
Nuisance builds up to a certain limit, and measuring this progression is important. Residents expressed the need for a tool that could track the build-up of nuisance over time, providing a more accurate representation of the long-term impact on their well-being. Currently, the design assesses specific moments of nuisance, so finding a way to measure the build-up of nuisance is crucial for future research.

Sound recordings: Indoors vs. outdoors
The sounds were analysed indoors. A key question is whether monitoring environmental sounds and wave movements is more effective indoors or outdoors. Identifying the environmental conditions caused by certain vessels would provide more detailed information beyond just the experience of nuisance.

Larger scale
The findings from this research are based on a small scale, primarily involving the older generation. Involving younger participants and a larger number of people would provide more insights into how this design could be applied on a larger scale.

Evaluation of Research Process

8.4

Figure 66 illustrates the time spent on each design phase in the Double Diamond model, a design process framework developed by the Design Council in the UK (Design Council, n.d.). It highlights that the majority of time was dedicated to the 'problem finding' phase, where the problem is discovered and defined, while less time was allocated to the 'solution finding' phase, which focuses on testing new ideas and solutions.

Context mapping is a valuable method for understanding the problem, but it is also very time-consuming. This time might have been better spent on the solution phase of the design process. A more central focus on the literature review and writing at the beginning would have been beneficial, as it would have helped to clearly explain the project's goal to stakeholders from the outset and increased my own sense of security.

Collaborating with houseboat residents to generate ideas could have significantly contributed to creating a more valuable solution.

Deductive Thematic Analysis was very useful to maintain the valuable insights and draw conclusion out of the given information.

Analysing and describing the findings should not be overlooked when writing the plan. My focus was primarily on taking action, which was effective in reaching out to stakeholders, but it's equally important to take a step back and reflect on the findings. As a result, there was a large reflection moment at the end, rather than gradually evaluating the results throughout the design process.

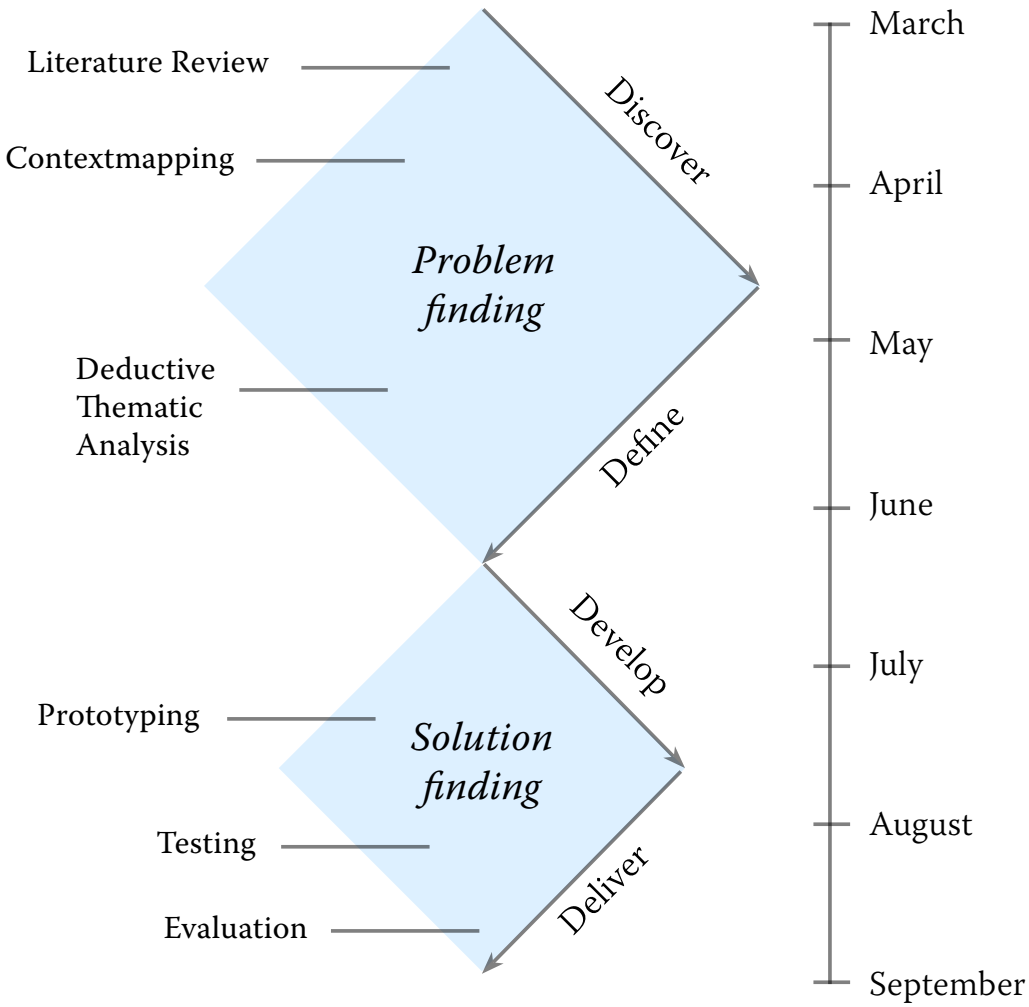


Figure 66. Design phases in the Double Diamond model

Personal and Academic Growth

8.5

Development of Skills and Knowledge
While doing this research, I gained experience in how to communicate effectively within a project involving many stakeholders.
I also developed new skills in managing a large project independently, including deciding which methods to use and for what purpose.

I learned the importance of staying in contact with the target group, understanding their availability for the research upfront, and managing expectations accordingly. Moreover, building trust and interacting on a human level, rather than as a researcher, helped encourage participants to share their stories openly.

The research sprints with MIT SAL were particularly valuable for presenting outcomes and discovering other fascinating projects. By befriending researchers from different cultures and even starting a music band with them, I also gained insights into their perspectives and approaches.

I am especially proud of applying thematic analysis in this research. Although I had never done this before, I quickly learned how to execute it and produce compelling results.

Prototyping with sensors was another new experience for me. I collaborated with others to make the prototype functional, and through this process, I learned the importance of incorporating others' input during prototyping. Being able to explain an idea clearly is essential to the design process, and it also makes the work more enjoyable than doing it alone. Additionally, I learned all the necessary steps involved in creating a prototype with sensors.

Overcoming Challenges and Problem-Solving
The biggest challenge in this research was organizing the results in a logical order for storytelling. Having numerous insights for different stakeholders made the design process very complex. My approach to solving this was primarily through presenting the results during the research sprints at MIT SAL and receiving feedback from Achilleas, the chair of my project, and Kars and Titus, my mentors. By gathering feedback, I could identify parts of the story that were unclear or needed further development.

Another challenge was managing the time expectations for methods I had never used before. Some tasks took longer than others, which required the planning to be very flexible. Additionally, unexpected happenings occurred that were beyond my control. For instance, two participants scheduled to test my prototype cancelled just two days in advance. I had to adjust the schedule from time to time to accommodate these changes.

Ethical Considerations
This research was highly dependent on the perspectives of houseboat residents. Their involvement through storytelling was crucial for conveying a strong message, which required

careful ethical considerations. Sharing their stories could only be done with their approval and it was essential to offer them the option to remain anonymous.

Recording the sounds of their environment with the prototype made me consider what the houseboat residents might find intrusive. Where is their line of what they are comfortable sharing? It was important to provide them with options that felt right for them and to show them the results before sharing them widely, as it can be difficult for them to anticipate what will be published.

What really helped was asking the residents how they wanted to be involved in the research before starting their participation and keeping them updated with honest information.

Conclusion

In conclusion, this graduation project explored the environmental nuisances experienced by houseboat residents in Amsterdam due to vessel traffic. The findings show that the experience of nuisance is influenced by both contextual factors (such as past experiences, type of boat, time, and location) and environmental factors (such as noise and movement).

By reflecting on insights gathered through qualitative research, this project aligns with its initial goal of exploring new methods for measuring environmental nuisance. The development of the 'nuiSENSE' tool not only provided residents with a solution for reporting nuisances that meets their needs but also demonstrated an approach to collecting data on nuisance that can be useful for policymakers.

The evaluation of the tool highlighted valuable directions for future research, which could further increase its impact and allow for broader applications in urban areas.

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Appendix A.1

Sensitizing booklet
Contextmapping

The sensitizing booklet is a horizontal A4 consisting of 17 pages. The figures show the content of the pages and is not the real size of the booklet.

Mijn naam:

.....

De naam van mijn woonboot:

.....

Ik woon hier sinds:

.....

Mijn woonboot:

Teken hier uw boot

Ik woon hier met:

.....

H1.2 Wonen op het water

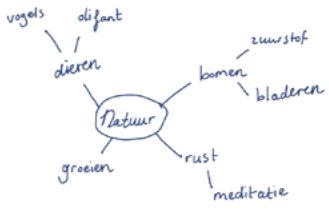
Wat typeert wonen op het water voor jou?

Vul de mindmap in op de volgende pagina volgens het volgende stappenplan:

1. De cirkel met het woord 'Wonen op water' heeft nu 3 takken(lijnen). Aan het einde van iedere tak, schrijf je een idee/gedachte in 1 woord op.
2. Heb je meer ideeën? Verbind dan nieuwe takken aan de cirkel met een nieuw woord.
3. Vervolgens teken je van ieder idee een nieuwe tak naar buiten waaraan je een nieuw woord toevoegt.

Wat is een mindmap?
Een mindmap is een diagram dat begint vanuit een centraal onderwerp en zich verder ontwikkelt als een boomstructuur.

Voorbeeld van een mindmap



Introductie

Hallo!

Fijn dat je mee wilt doen aan mijn onderzoek.

Onder begeleiding van MIT SAL en TUDelft onderzoek ik hoe woonbootbewoners overlast door bootverkeer/badgasten ervaren. Hoe ervaar jij overlast door bootverkeer en waarin kan de overlast voorkomen worden?

Ik ben geïnteresseerd in jouw verhaal want jij bent de expert.

Werkboek
In dit werkboek staan 5 opdrachten. Vul de opdrachten in als voorbereiding op ons gesprek. Ze helpen ons alvast een duidelijk beeld te krijgen van jouw verhaal.
Alles is goed, ik ben geïntereseerd in jouw antwoorden!

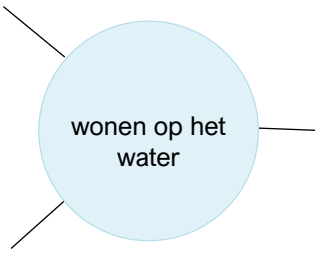
Ik ga met respect de informatie behandelen en bespreken. En de informatie zal niet gedeeld worden zonder jouw toestemming.

Gesprek
Op ..... hebben we een gesprek
Neem dit boekje (ingevuld) mee naar het gesprek.

Nina te Groen

Ik studeer Industrieel ontwerpen aan TUDelft

Tip: Wat hoor/zie/voel je?

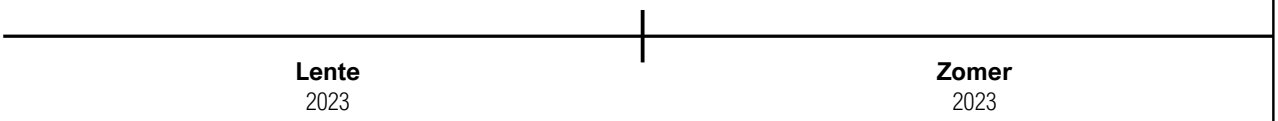


H1.2 Mijn ervaring van bootverkeer op een tijdlijn

1. Welke gebeurtenissen heeft u bij het voorbijvaren van boten ervaren in 2023/2024? Welke partijen waren hierbij betrokken?

   Dit kunnen zowel positieve als negatieve ervaringen zijn geweest.

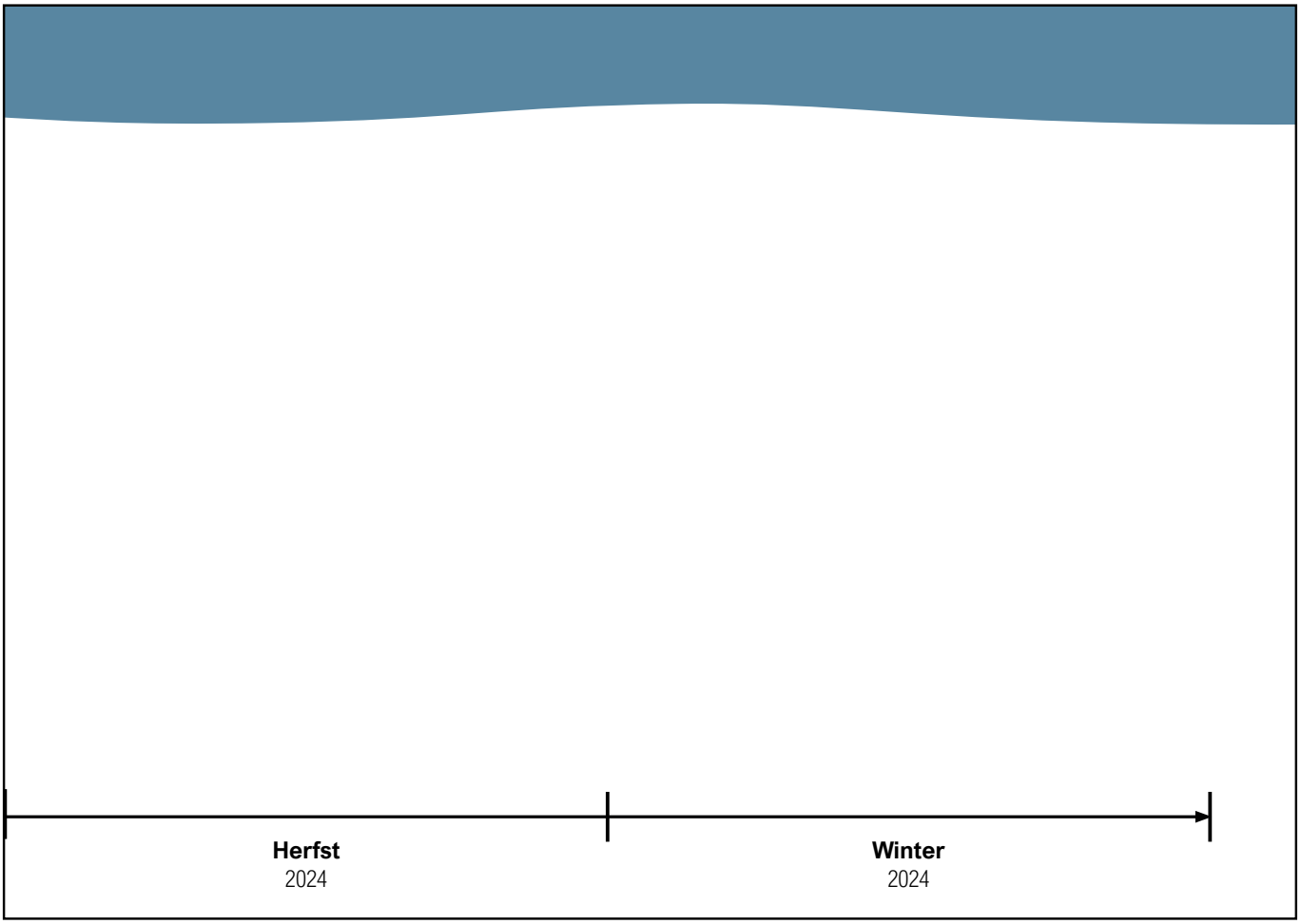
   Geef dit aan op de tijdlijn door dit er zelf bij te schrijven.



H1.2 Positieve en negatieve ervaringen

2. Bekijk de tijdlijn en plak een groene sticker bij de dingen op de tijdlijn die positief zijn.

3. Bekijk de tijdlijn en plak een rode sticker bij de dingen op de mindmap die negatief zijn.



H1.3 Één ervaring uitgelegd

1. Plak de sticker op de tijdlijn bij de gebeurtenis die voor het meeste overlast heeft gezorgd.

2. Wat gebeurde er tijdens deze gebeurtenis?

Denk aan:
Wie veroorzaakte overlast?
Waar was jij?

H1.3 Één ervaring uitgelegd

3. Hoe voelde je je bij de beschreven gebeurtenis?
Kruis de best passende emotie(s) aan

☐ ☐ ☐ ☐ ☐ ☐ ☐

4. Waarom voelde je je zo?

H2 Citizen science

De vorige vragen gingen over jouw beleving van overlast. Hiernaast onderzoek ik ook hoe woonbootbewoners betrokken willen en kunnen worden tijdens het *meten* van overlast.
De volgende vragen gaan om die reden over het meten van overlast door middel van **citizen science**.

*Wat is **citizen science**?*

Het betrekken van burgers bij wetenschap wordt Citizen Science genoemd. Toenemende digitalisering maakt het mogelijk om burgers te betrekken bij wetenschappelijk onderzoek.

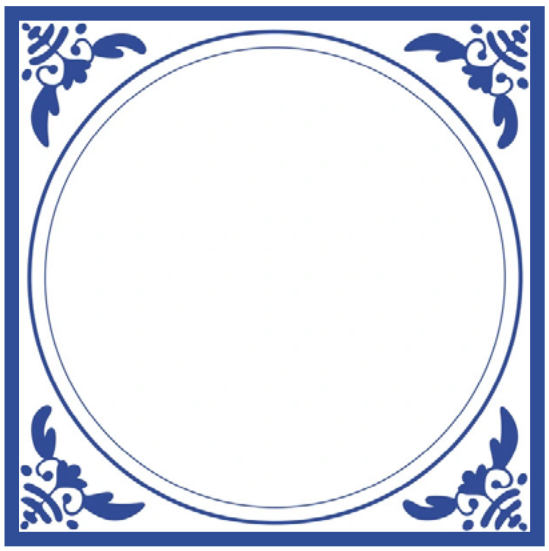
Voorbeeld: De Oorzaak

De Oorzaak is een onderzoek naar omgevingsgeluid waarbij burgers hun eigen omgeving meten. Van mei '24 t/m april '25 brengt Burgeronderzoek De Oorzaak slimme geluidssensoren omgevingsgeluid in kaart in Antwerpen, Gent en Leuven. Deze geluidssensoren zijn voorzien van een AI module die het geregistreerde geluid toewijst aan een geluidsbron: was dat bijvoorbeeld een passerende auto, fluitende vogel, rijdende tram of de ruisende wind?
Zie: www.uantwerpen.be/

H1.4 Mijn advies

Wat zou jouw gevoel van overlast kunnen verminderen?

Dit is mijn advies voor : .....



Wat als... jij als woonbootbewoner overlast meet met behulp van technologie om onze leefomgeving in kaart te brengen en te verbeteren

H2.1 Het meten van jouw omgeving

1. Wat is voor jou belangrijk om te meten?
Meerdere opties zijn mogelijk

☐ **Geluid**

Voorbeeld

Amsterdam Sounds
Een platform voor het meten van geluidsoverlast in de binnenstad van Amsterdam

☐ **Golfbeweging**

Voorbeeld

Nexsens Technology
Een in de VS gevestigd bedrijf dat de beweging en kwaliteit van water meet met sensoren.

☐ **Luchtkwaliteit**

Voorbeeld

De snuffelfiets
In dit experiment wordt luchtkwaliteit gemeten op de fiets door participerende burgers in Utrecht

☐ **Anders, namelijk:**

2. Waarom?

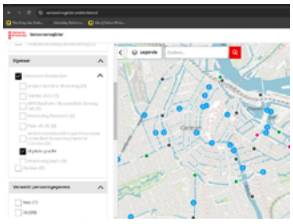
H2.2 De rolverdeling

1. Wie moeten volgens jou de metingen van overlast uitvoeren?
Geef dit aan op de lijn door een kruis te zetten

De inwoners ←→ *De overheid*

De Waag- Future Lab

Burgers krijgen zelf open-source tools om hun leefomgeving te meten en leren de data te interpreteren



De Digitale Gracht

Gemeente Amsterdam plaatst sensoren in de stad die de verkeersdrukte meet

H2.1 Het meten van jouw omgeving

3. Wat wil je bereiken met deze metingen?

4. Welke plekken op jouw woonboot zijn geschikt voor deze metingen? En waarom?

2. Leg uit:

Bedankt voor het invullen!

Graag ontvang ik foto's van de ingevulde pagina's naar

Dan ben ik beter voorbereid voor ons gesprek op .....

Appendix A.2 Interview Questions
Contextmapping

Interview woonbootbewoners

Beste....
Fijn dat je je ervaring van overlast voor mijn onderzoek wilt delen.
De resultaten van dit onderzoek komen in mijn verslag te staan en helpt mij de context beter te begrijpen waarvoor ik ga ontwerpen. Voor deze opdracht ga ik een tool ontwerpen die overlast door bootverkeer/badgasten bij woonbootbewoners meet, waarbij ik woonbootbewoners wil betrekken in het ontwerpproces. Mocht je het leuk vinden, betrek ik je ook graag bij het testen van mijn ontwerp.

Ik werk samen met MIT SAL, waar wordt ontworpen met data en sensoren, en ik doe dit afstudeerproject voor mijn studie bij TUDelft.
Het interview wordt met uw goedkeuring opgenomen, zodat ik dit kan terug luisteren. Verder worden de opnames niet verder gebruikt zonder dit bij u na te vragen.
Om lezers (andere woonbootbewoners, TUDelft, MIT SAL, gemeente Amsterdam) een beeld te geven van de doelgroep maak ik graag een foto van de boot en van jou/jullie in de boot.
Deze foto kunnen we na het gesprek maken of een andere dag of helemaal niet. Wat jou het fijnste lijkt.
Voordat we beginnen met de vragen wil ik jullie vragen de consent form te lezen en in te vullen.
Consent form geven

Voor dit project onderzoek ik drie delen:

1. *Uw ervaring van overlast*: Waar ervaart u het meeste overlast van en wat heeft u nodig om de overlast te beperken.
2. *Het melden van overlast*: Wat zijn + en – punten van de huidige situatie van melden van overlast.
3. *Citizen science*: Hoe zou technologie kunnen helpen om jouw boodschap te communiceren?

Hoe was het om het boekje in te vullen? Wil je er graag wat van uitlichten of delen?

Uw ervaring van overlast (20 min)

1. Wanneer heeft u voor het laatst overlast ervaren door bootverkeer/badgasten?
2. Welke gebeurtenis heeft voor het meeste overlast gezorgd afgelopen jaar? (zie tijdlijn)
   - Wat voor geluid/beweging vond er toen plaats?
   - Wat zorgde ervoor dat dit geluid/beweging belastend voor je was?
   - Welk gevoel kreeg je hierbij? En wat maakt dat je dit gevoel kreeg?
3. Stel je voor dat alles kan. Wat zou Idealistisch aangepast **moeten** worden om overlast voor jou te beperken?
4. Wat zou denk je realistisch gezien aangepast **kunnen** worden om overlast voor jou te beperken?

Overlast melden (15 min)

5. Heb je ooit overlast gemeld bij gemeente Amsterdam? (ja → 1, nee →)

Overlast gemeld (1)

6. Wat waren hierin de stappen vanaf het ervaren van overlast tot de melding?
7. Hoe heb je de melding gedaan?
   - Hebben andere woonboten de gedeelde overlast?
8. Wat is er gebeurd nadat je de melding had gemaakt?
9. Hoe heeft gemeente Amsterdam jou geholpen?
10. Wat had gemeente Amsterdam hier beter in kunnen doen?
    - Wat zou je graag ontvangen van ze?
    - Wat is de reden waarom dit nog niet gebeurd denk je?

Geen Overlast gemeld (2)

1. Zou je overlast willen melden?
   - Waarom wel/niet? Wanneer denk je hier overna?
   - Wat zou kunnen helpen om de melding te doen? Hoe zie je dit het liefst?
   - Weet je hoe dit moet?

2. Wat hoop je te ontvangen van gemeente Amsterdam na het melden van overlast?

Citizen science (15 min)

1. In het boekje stond citizen science beschreven. Was je hier al bekend mee? Wat was nieuw voor je en waar had je nog vragen over?
2. Wat zou gemeten kunnen worden om jouw beschreven gebeurtenis van overlast vast te leggen? Hoe zou jij dit doen?
3. Zou je metingen willen doen om jouw ervaring vast te leggen? Zou je hiervoor jouw ervaring willen delen en sensoren plaatsen op uw woonboot?
4. Wat is jouw rol in het oplossen van overlast? En wat is de rol van gemeente Amsterdam hierin?

Appendix A.3

Consent Form
Contextmapping

Consent form – Interview

Algemene afspraken

Ik doe vrijwillig mee aan dit onderzoek, en ik begrijp dat ik vragen niet hoef te beantwoorden als ik dat niet wil. Ik begrijp dat ik op elk moment kan stoppen met het onderzoek, zonder dat ik dat uit hoef te leggen.	Ja / Nee
Ik begrijp dat ik voor de deelname van het onderzoek aan mij de volgende dingen gevraagd worden om te doen: • Invullen van het ontvangen boekje • Het opsturen van foto's van het ingevulde boekje naar het whatsapp nummer of mail • Beantwoorden van vragen tijdens het interview	Ja / Nee

Delen, verspreiden en gebruiken van de uitkomsten van het onderzoek

Ik zal de informatie van de verschillende interviews samenvoegen in een afstudeerverslag die openbaar wordt gemaakt door TUDelft op https://repository.tudelft.nl/.
Deze informatie kan zowel autoniem als anoniem worden gemaakt.
Anoniem = dat de informatie die u heeft gegeven dan niet terug te leiden zijn naar u.
Autoniem = De informatie die u heeft gegeven zijn terug te leiden naar uw naam en leeftijd.

Ik geef toestemming om mijn antwoorden, uitspraken of ideeën **anoniem** te delen	Ja / Nee

Of

Ik geef toestemming om mijn antwoorden, uitspraken of ideeën **autoniem** te delen	Ja / Nee

Deze informatie wordt gedeeld met de volgende belanghebbende: MIT SAL, TUDelft, gemeente Amsterdam en deelnemers van dit onderzoek

Ik begrijp dat de informatie uit het interview gedeeld kan worden met MIT SAL, TUDelft, gemeente Amsterdam en deelnemers van dit onderzoek	Ja / Nee

Foto’s

Ik maak alleen met uw toestemming een foto van u en/of uw woonboot om een beter beeld te geven van hoe jij leeft in jouw omgeving aan lezers van mijn verslag en de belanghebbende van dit project.

Ik geef toestemming voor het maken en delen van een foto van het buitenaanzicht van mijn woonboot	Ja / Nee
Ik geef toestemming voor het maken en delen van een foto waarin ik herkend kan worden	Ja / Nee
Ik geef toestemming voor het maken en delen van een anonieme foto	Ja/Nee

Geluidsopnames

Voor dit onderzoek zullen geluidsopnames gemaakt worden. Dit zal alleen worden gedaan met jouw toestemming. In de geluidsopnames wordt gevoelige en persoonlijke informatie gedeeld, en zullen daarom alleen gebruikt en beluisterd worden door mij. De geluidsopnames zullen niet gedeeld worden met andere mensen.
De geluidsopnames zullen aan het einde van het onderzoek verwijdert worden, in oktober 2024.

Ik geef toestemming voor het maken van geluidsopnames tijdens het interview.	Ja / Nee
Ik geef toestemming voor het maken van geluidsopnames van mijn leefomgeving	Ja / Nee

Handtekeningen

_____	_____	_____
Naam deelnemer	Handtekening	Datum

Ik, **de onderzoeker**, verklaar dat ik de informatie en het instemmingsformulier correct aan de potentiële deelnemer heb voorgelezen en, naar het beste van mijn vermogen, heb verzekerd dat de deelnemer begrijpt waar hij/zij vrijwillig mee instemt.

_____	_____	_____
Naam onderzoeker	Handtekening	Datum

Appendix B.1 Pre-made Codes
Deductive Thematic Analysis

(WHAT) Q1:
What boat activity causes nuisance?
1. Announcements from tour boats
2. Noise on the water
3. Waves that causes rocking the boat
4. Boats that cross the speed limit
5. The power of the screw
6. Events

(WHO) Q2:
Which drivers of boats cause nuisance for houseboat residents?
1. Drivers that are unaware of the nuisance that they create
2. Inexperienced drivers

(HOW)Q3:
How is nuisance experienced by houseboat residents?
1. There is a lack of trust in reporting nuisance
2. Feeling powerless
3. Lack of joy while being at home
4. Experience of the past triggers nuisance
5. Nuisance occurs when being disrupted in own activity
6. The nuisance repeats itself
7. The need for expressing feelings while being irritated
8. Seeing the nuisance affect the level of nuisance
9. Nuisance is being built up

(WHEN) Q4:
When do houseboat residents experience nuisance caused by canal traffic?
1. With nice weather
2. During the weekend
3. During peak season
4. During events (Kings-day)
5. Constant (the whole day)
6. During the night
7. During the summer

(WHY) Q4:
Why do houseboat residents experience nuisance according to houseboat residents?
1. Issuing permits becomes a source of income
2. A lack of feedback after reporting nuisance
3. Having little influence as a houseboat resident
4. There is a lack of enforcement
5. Amsterdam is very busy during peak season
6. The rules are different in each region of Amsterdam
7. Tourism

Appendix B.2

Creating Themes
Deductive Thematic Analysis

2

Overlast door bootverkeer ontstaat bij geluidoverlast en schommelingen

Geluidsoverlast

Schroef maakt lawaai onder water

We hebben onder water het geluid, de schroef maakt meer herrie

De dieselmotor die stil stonden maakt lawaai en veel gemonk. Maar nu zijn die motoren zo sterk dat je last van de schroef hebt.

Er zijn ook altijd rederijen die hebben nog grotere schepen...
...en die douwen je zo van de kade weg.
Met alle gevolgen van dien, dan gaan die motors aan, die schroeven aan...
...en dan blijft die een beetje ronddraaien tot die lange bak weg is.

En ik heb veel geluidsdichte namen, maar nu krijg ik het toch nog binnen via de bodem.
En de ergernis is niet alleen van mezelf, maar ook van die arme vissen.

Lawaai op het water

Ja, geluid vind ik eigenlijk het grootste probleem hier, he?
Zoals ik me nu van laatste jaren herinner.
Beweging hebben we hier iets minder last van.
Ik heb op zich niet zo veel last van beweging.

Van de muziek en gewoon van schreeuwende mensen.
Dus er komen echt boten voorbij, van die grote open sloepen zijn nu heel erg in.
En die staan helemaal mutjevol met jonge mensen.

En het is helemaal geen probleem dat je hier vaart,
maar wel dat je zo keihard muziek aan hebt of dat je te hard vaart.

Dus dan wordt geschreeuwd, dan wordt luidruchtig, soms muziek gemaakt,
soms met, hoe heet dat, versterkte muziek.

Alle geluiden eigenlijk die uit de boot voortkomen.
Want dat allemaal samen geeft gewoon veel te veel volume.

En er is gewoon te veel lawaai op het water, het is te druk op het water, er wordt te hard gevaren op het water, het stapelt zich allemaal op.

Het gunstige geval, maar ik hoor het geschreeuw hoor ik eigenlijk al als ze onder de brug vandaan komen.

Nou, hier kunnen we wel door heen praten, maar dan niet meer.
Dan moet je echt wachten tot het voorbij is. En stel dat je een film zit te kijken of naar muziek luisert, of je bent daar mee bezig, dan uh ja, moet je maar... ja dan is dat gewoon een hoop herrie.

Omroepingen van rondleidingen

Het toppunt van vond ik wel dat er zo'n sloep langskwam en die bep dan te vertellen dat dat plein in de vakantie heerlijk was. Het was zo lekker rustig. Ik zeg 'ja totdat je langs kwam.'

Wat mij met name irriteert dat is dat als er rondleidingen worden gegeven. Dat begrijp ik best en dat vind ik ook allemaal wel prima dat dat niet zodanig wordt gereguld dat de omgeving er zo min mogelijk last van heeft.

. Want oh ja, geluidsoverlast, dat zijn de schroeven. Maar het is ook het omroepen. Dus dat gebiets aan boord, dat gaan ze iets over mij vertellen, wat helemaal niet klopt trouwens.

Nee, de sloepen hebben veel overlast omdat ze elke keer hetzelfde fullverhaal vertellen. Luidruchtig als ze langs varen.

Schommelingen

Boten varen te snel

Maar dat er structureel te hard gevaren wordt. Waar alle boten hier last van hebben, ik ben niet de enige en dat zal je ook wel horen van de anderen.

Het meeste overlast geeft toch incidenten, je hebt iemand die heel snel vaart hier langs, de boot gaat heen en weer of heel veel lawaai s nachts bijvoorbeeld 3:00u s nachts. Keiharde house van een bootje. Ja, dat is gewoon super irritant. Maar goed dat dat gaat weer voorbij.

Nee, afgelopen zomer is natuurlijk is ook heel veel pleziervaart. Af en toe is er een keer iemand die echt veel te snel gaat, ja, dat gebeurt. Daar omkom je toch niet aan. Ik vind het helemaal niet erg als dat één of twee keer gebeurt.

achteruit varen

Dat je dus daar bent en dat je dus meens plotseling in zijn achteruit gaat. Op zijn rem en dan achteruit. En dat gebeurt echt veel.

Draaien van boten

En dat gaat de hele dag door op mijn plek omdat ze hier gaan draaien voor die huisjes aan de overkant die scheef staan. En dus deze attractie willen zien en dan gaan ze van vooruit naar achter en heen en weer.

ze kwamen aan varen, tot hier, echt voor ons schip, halverwege, midden schepen, ging die draaien en dan voerde die weer weg, en dat was per dag een drie of vier keer.

Maar heel irritant, maar dat zal nu niet meer gebeuren, dat ze dan hier invaarden toen de brug dicht was. En dan pas hier, daar je maar ook borden, maar hier beseffen, oh jee, we kunnen niet door.

Het afmeren van boten

Niet echt op de rem zetten, maar ze inekken op wrolf ze remmen af bij het afmeren

Overlast is afhankelijk van de bootbestuurder

overlast is afhankelijk van bootbestuurder

Ja dus de mate van geluid is heel verschillend, van helemaal geen last tot heel veel last.
Als degene die de rondvaart begeleid enorme adhd heeft dan hoor ik het wel heel duidelijk is zelfs een keer zo dat ik worst naar buiten liep, dat was een van mijn studenten die dat praatje hield.

nou, ik heb uitgelegd dat er gesproken rondvaarten zijn en dat die het het het beetje afhankelijk van degene die dat doet, maar dat die erg veel last veroorzaakt

Dit is permanent afsluit je in een garage met auto's zit te klooien.
De hele tijd "aan, uit, aan, uit"
Voor elke kapitein is dat anders

Onervaren bootbestuurders

Nou ja, gewoon dat je non-stop een file aan boten had hier, en dat daar dus heel veel mensen ook in bootjes zaten die niet konden varen, waardoor je echt aanvaringen krijgt, en dat ze tegen je schip aan botsen.

En ja, sommige mensen kunnen gewoon echt niet sturen, dus die zitten bovenop zo'n boot en dat klinkt enorm door als ze tegen je aanvaren.

Maar dan is het, en überhaupt is de situatie chaotischer, waardoor vooral de huurvloeggen die zijn, dat zijn over het algemeen gewoon mensen die eigenlijk
niet kunnen varen

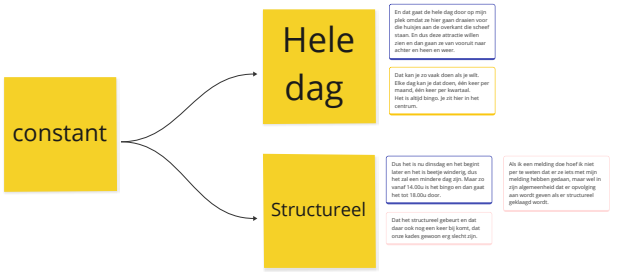
Mensen kijken ook naar elkaar van wat kan.
En er is niks nodig op het gebied van vaartewijzen of wat dan ook, iedereen kan in zo'n bootje klimmen. Dat zie je dus hier ook vaak dat toeristen niet kunnen varen.

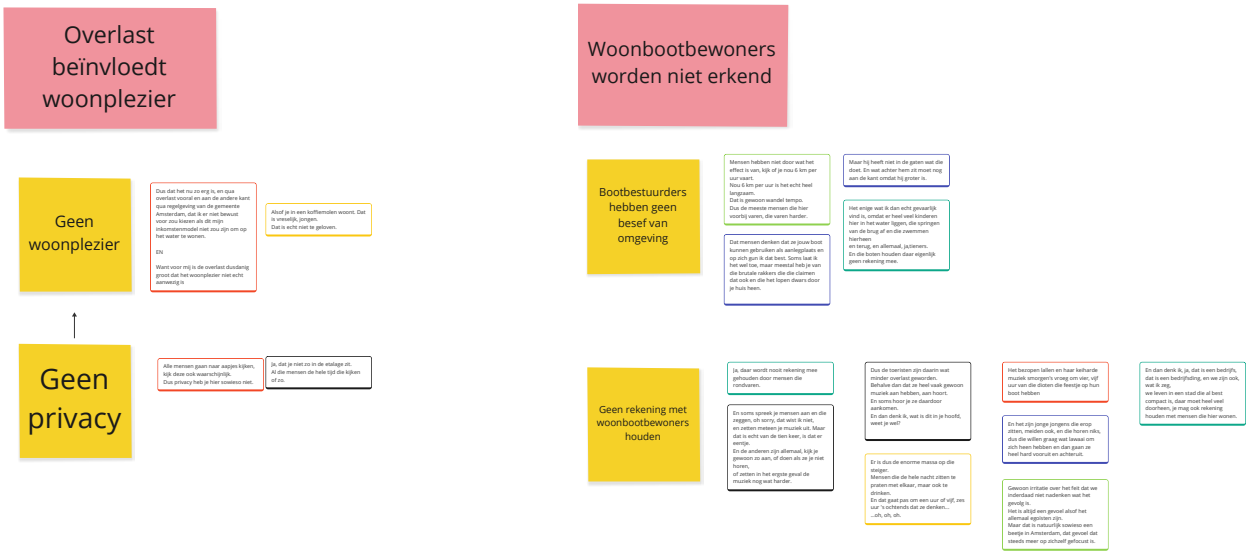
Ja, want ik heb niet zoveel van het bedrijf zelf last natuurlijk, maar van de toeristen die het huren. Die kunnen niet varen, die hebben géén idee hoe een roer werkt. En die knallen gewoon tegen je boot aan.

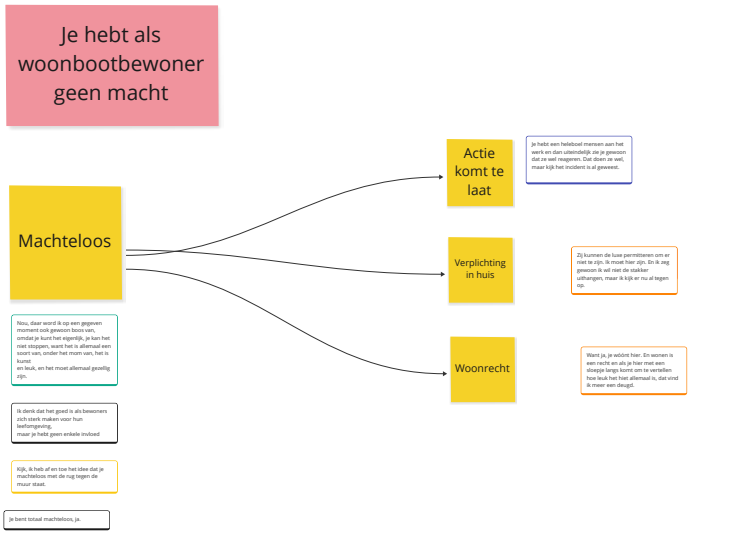
3

Overlast door bootverkeer beïnvloedt de leefbaarheid van woonbootbewoners

Overlast is constant tijdens hoogseizoen




Overlast beïnvloedt woonplezier
Geen woonplezier
Geen privacy
Woonbootbewoners worden niet erkend
Bootbestuurders hebben geen besef van omgeving
Geen rekening met woonbootbewoners houden


Je hebt als woonbootbewoner geen macht
Machteloos
Actie komt te laat
Verplichting in huis
Woonrecht

4

De invloeden op de ervaring van overlast is complex

Het zien van overlast

Overlast zien

Wel als ik in de, zeg maar, daar bij het water zit en ik zie ze keihard varen, dan is het wat anders. Want dan stoort het me weer dat ze zo hard varen

En als ik niets zie, heb ik er alweer iets minder last van beweging dan als ik ze zie.

Het is ook gevaarlijk, want het is een grote boot, draait ook gewoon en dan moet iemand die er toevallig moet die maken die de weg kormt. En je ziet het ook wel bijna misgaan vaak.

Want het is zelfs dat ik als ik buiten werk ook de boel in de gaten hou. Dat wordt een soort tweede natuur.

Verschil in sensitiviteit

Afhankelijk van bezigheid

En juist omdat het ook stil kan zijn, is alles wat die stilte verstoort hoor je meer dan als het een continu groesemoes is.

Dat je gewoon, stel je voor muziek luistert. Of ik zit en maak dan filmpjes bijvoorbeeld. Of ik zit nu met jou in een interview. Dan zou dat heel erg gestoord worden door dat geluid. Dat is eigenlijk het enige.

Overlast is persoonlijk

Dus ja, dat is wel echt wel een van de lastige dingen van mij hoor, dat ik op een of andere manier de hele wereld wil opvoeden.

Ik denk als ik doof zou zijn, dat ik een heel fijn leven zou hebben hier. Maar ik denk dat ik er ook wat gevoeliger voor ben dan de doorsnee persoon. Dat moet ik wel heel eerlijk zeggen.

de grens van irritatie

Opbouwen van irritatie

Kijk voor mij geldt bij overlast dat ik. En dat is hetzelfde als met geluidsoverlast. Een tijd lang kan je dat prima verdragen en op een gegeven moment dan gaat het je irriteren. En op een bepaald moment ben je het zat je, dat is dat bouwt zich heel langzaam op.

Maar het kan best wel zijn, dat op een gegeven moment een soort verzadigingspunt bij mij bereikt, dat ik denk, ja, daar heb ik gewoon geen zin meer in, ik ga weg.

Ik denk ook dat ik dat ik heel sterk ben op gevoel van vertrouwen. Dus ik voel wanneer iets wel of niet goed is of goed voelt. Maar het is natuurlijk heel subjectief. Voor mij zorgt dat dus voor ofwel irritatie, ofwel dat ik er mij gewoon hier niet aan stoor. Ja, het is heel, het is eigenlijk heel zwart wit, er zit eigenlijk niet iets grijs tussen.

Afhankelijk van tijdstip

S'nachts

Als het mooi weer is, ook s'nachts, als het lekker warm is, dan heb je een heleboel idioten die gaan keihard de muziek draaien op hun boot, vier uur s'ochtends, vijf uur s'ochtends. Die gaan langs komen varen. En dan word je weer wakker.

Ervaringen in het verleden

schommeling voelt negatief

Eh ja, ik weet ik niet, misschien is dat een gevoel of misschien wel een soort van evenwichtsorgaan of zo. Ik weet niet wat het is, maar daardoor roept het gewoon iets negatiefs op

Ik koppel zeg maar het bewegen van de boot aan te hard varen. En dat is dan die negativiteit. Ja en als het drie keer op een dag gebeurd nou dan heb je echt prachtige dag gehad. Maar als het honderd keer op een dag gebeurt dan vind ik het niet zo leuk meer.

Herhaling van overlast

Er wordt niet naar geluisterd en dan gaat het gevoel van irritatie wordt steeds meer als je het ervaart.

Dat was een extreem voorbeeld, dat is maar één keer op die manier gebeurd. Maar dat geeft wel een beetje aan dat we daar nogal alert op zijn.

Ik werd van de week wakker van bootjes die 's nachts voorbij voeren. En die voeren heel zachtjes voorbij hoor, maar dan hoor je de schroef. En ik denk dat als dat weer vaker gebeurt dat ik er dan op een gegeven moment wel weer doorheen slaap, maar nu is het weer van 'hè' Het is een geluid wat onbekend is

Ja, dus dat roept een oude stressreactie op. Dus ondanks dat zeg maar de echt hele grote overlast best wel lang geleden is, merken wij allebei dat onze tolerantiegraad hier heel laag ligt.

De gemeente gebruikt de mogelijkheden die er al liggen, zoals de grachtenmonitor en AIS, niet. Het is ontzettend frustrerend dat er gewoon niks gebeurt. In het tegendeel, de overlast neemt alleen maar toe

Appendix C

The Code
Prototyping

9/23/24, 1:34 PM pushcode2.py *

```
  1 # Import all necessary packages
  2 import RPi.GPIO as GPIO
  3 import os
  4 from datetime import datetime
  5 from time import sleep
  6
  7 # GPIO setup, input of the red button is connected to pin 2
  8 GPIO.setwarnings(False)
  9 GPIO.setmode(GPIO.BCM)
 10 GPIO.setup(2, GPIO.IN)
 11
 12 # This loop runs continously
 13 while True:
 14
 15     # If button is pressed proceed into the statements below
 16     if GPIO.input(2) == 0:
 17
 18         # retrieving the time and date and make a string (textline) of it
 19         current_datetime = datetime.now().strftime("%Y-%m-%d_%H:%M:%S")
 20         str_current_datetime = str(current_datetime)
 21
 22         print("Button is pressed")
 23         #os.system("arecord -D dmic_sv -c2 -r 48000 -f S32_LE -t wav -V mono -v --
duration=5 /home/twanschoonschip/Desktop/OPNAMES/%s.wav" % (str_current_datetime))
 24
 25         # Record for 60 seconds and save the file with the current time and date
 26         #os.system("arecord -D plughw:1 -c1 -r 48000 -f S32_LE -t wav -V mono -v --
duration=30 /home/twanschoonschip/Desktop/OPNAMES/%s.wav" % (str_current_datetime))
 27         os.system("arecord -D plughw:1 -c1 -r 48000 -f S32_LE -t wav -V mono -v --
duration=60 /home/twanschoonschip/Desktop/OPNAMES/%s.wav" % (str_current_datetime))
 28         sleep(60)
 29         #os.system("aplay recording.wav")
 30         #text = 'Hij werkt'
 31         #with open('/home/twanschoonschip/Woonboot/%s.txt' % (str_current_datetime), 'w')
as f:
 32         #    f.write(text)
 33         # /media/twanschoonschip/OPNAME NINA/OPNAMES
```

Appendix D

Manual
The Design

Handleiding

Overlast meldknop

De 3-daagse test

Bij deze wil ik u enorm bedanken voor het deelnemen aan deze test. Vier woonbootbewoners zullen deze 3-daagse test uitvoeren en ook u bent daar onderdeel van.

Het ontwerp ‘De overlast meldknop’ legt uw ervaring van overlast door bootverkeer vast. Hiermee hoop ik woonbootbewoners te ondersteunen in het melden van overlast.

De prototype die u gaat testen is een eerste versie van het ontwerp. (zie figuur 2) Gedurende de aankomende drie dagen vraag ik u om overlast te melden met het prototype. Dit doet u door op de rode knop te drukken en daarna de vragenlijst in te vullen. Zie figuur 1.

Wanneer u op de knop drukt wordt voor 1 minuut de decibel van het geluid in huis gemeten.

Deze test werkt als een oefening voor het melden en meten van overlast.

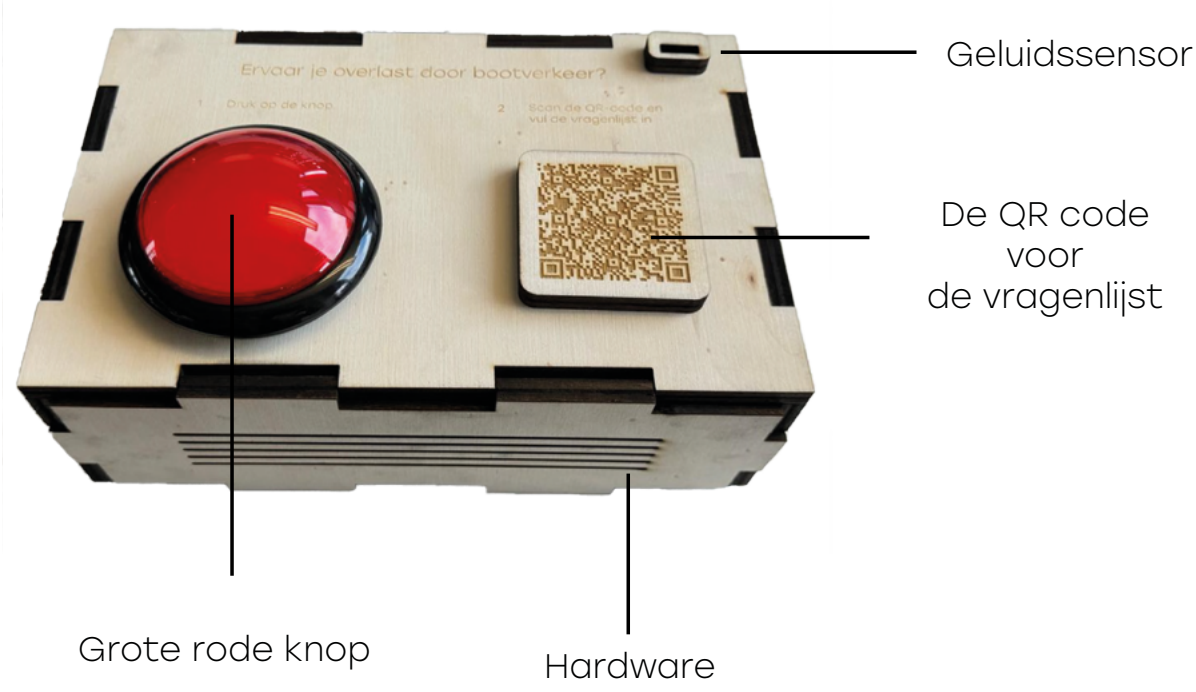
Mocht het verlopen als gewenst, dan kan ik de resultaten van de test analyseren.

De werking van de test en het prototype zal verder in deze handleiding uitgelegd worden.

Figuur 1

Het prototype

Figuur 2



De Hardware

De hardware is al het tastbare in en rond een computer(systeem). Met andere woorden de fysieke apparatuur.

Grote rode knop
Wanneer u op de knop drukt wordt het geluid in uw huis gemeten voor 1 minuut.

Hardware
Er zit een kleine computer (Een Raspberri pi) in de behuizing van het model die de metingen van het geluid opslaat op een sd-kaart. Kijk op deze website als je hier meer over wilt weten

www.raspberrypi.com

Geluidssensor
Het geluid in uw omgeving wordt opgenomen met een mini microfoon. De eigenschappen van het geluid worden hierna onderzocht.

Privacy
Alle informatie uit deze test zal met respect behandeld worden.
Tijdens de test worden de volgende opnames gedaan:

- Er worden automatisch willekeurige opnames gemaakt om de geluidseigenschappen **zonder overlast** vast te stellen. Deze gegevens zijn niet te herleiden naar de deelnemer, zoals in figuur 3.
- Het geluid wordt voor 1 minuut opgeslagen wanneer er op de knop gedrukt wordt. Hierin heeft u de keuze uit de volgende twee opties:

1. De geluidsopnames van een overlast melding (dus wanneer u op de knop drukt) worden terug geluisterd én worden omgezet in getallen. Dit betekent dat ik de opname kan beluisteren en analyseren, wat een breder beeld kan geven van de ervaring van overlast.

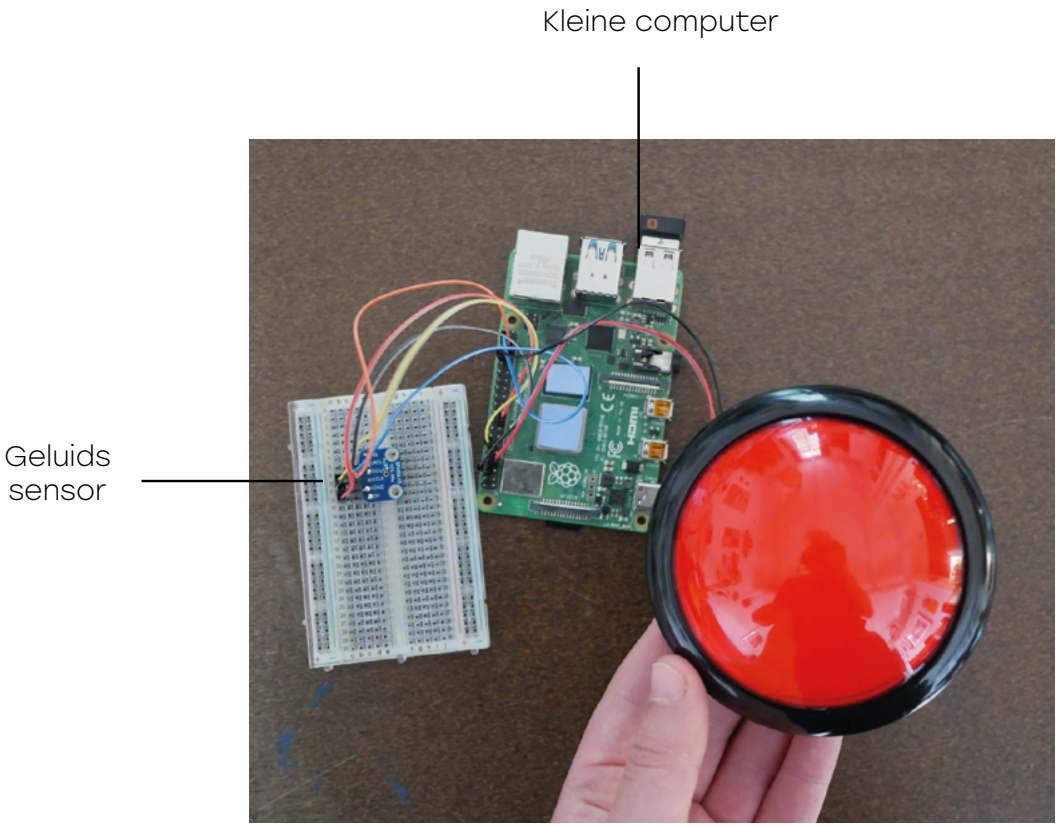
   Of

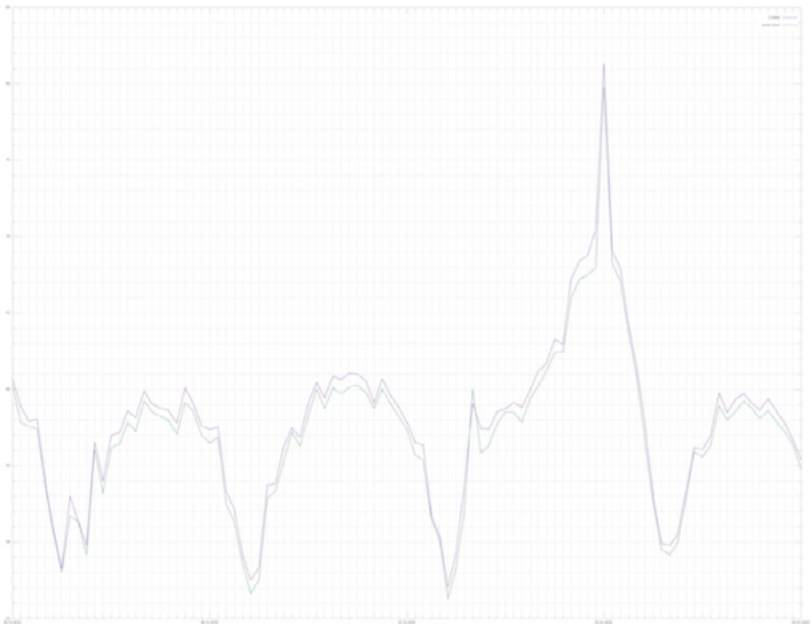
2. De geluidsopnames worden omgezet in getallen (zoals in figuur 3) en zijn niet te herleiden naar de deelnemer.

Welke optie kiest u?
Kruis het vakje aan

☐ Optie 1

☐ Optie 2





Figuur 3

Het doel

Uw ervaring met de prototype

Het hoofddoel van deze test is om te bekijken in hoeverre het ontwerp voldoet aan zijn doelen.
Deze doelen maak ik bewust niet bekend, omdat ik u niet wil sturen in een bepaalde richting.

Probeer kritisch te kijken naar het ontwerp de aankomende 3 dagen.
Maak notities wanneer u wilt in het notitieboekje.

Op
om
hebben wij een evaluatiegesprek gepland.

We gaan dan bespreken hoe u het melden van overlast met het prototype heeft ervaren.

Resultaten van de meldingen

Het model zal getest worden door 4 woonbootbewoners.

Mochten de geluidsmetingen gelukt zijn, ga ik de decibelmetingen en de uitslag van de vragenlijst analyseren en vergelijken met elkaar.

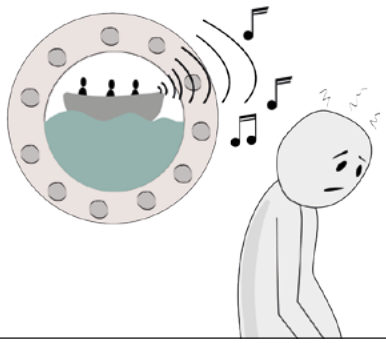
Ik ga dan kijken of ik een verband kan leggen met de decibelmetingen en uw ervaring.

De resultaten die hieruit komen worden gedeeld in mijn verslag en dit zal ik ook met u delen.

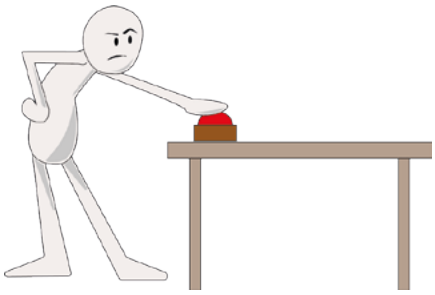
Het ontwerp

Tijdens deze test wordt een gedeelte van het gehele ontwerp onderzocht.

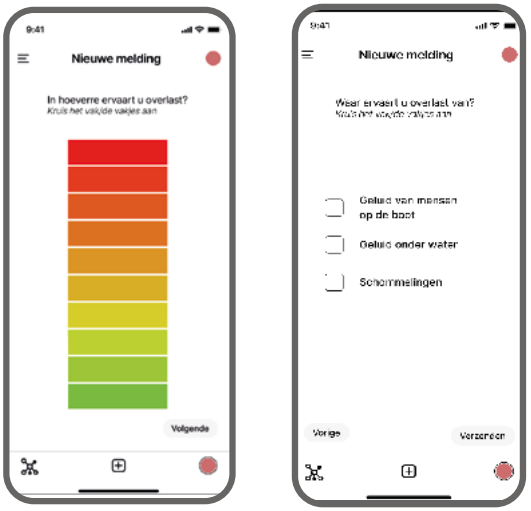
De storyboard op de volgende pagina laat het gebruik van het gehele ontwerp zien.



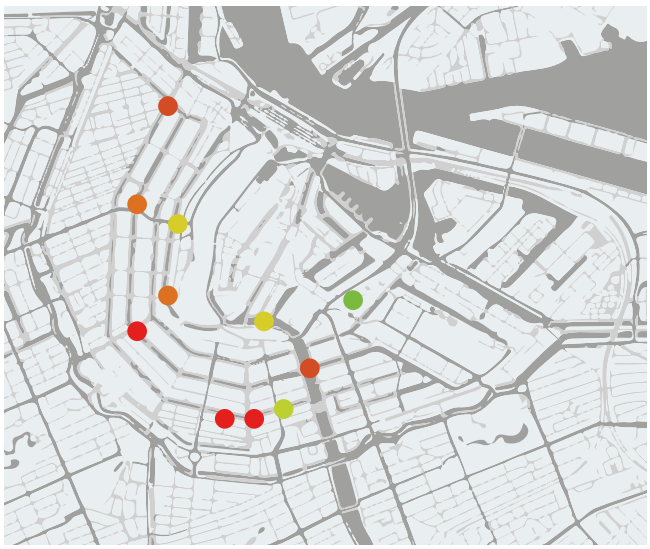
Max, de woonbootbewoner ervaart overlast door een boot met versterkte muziek



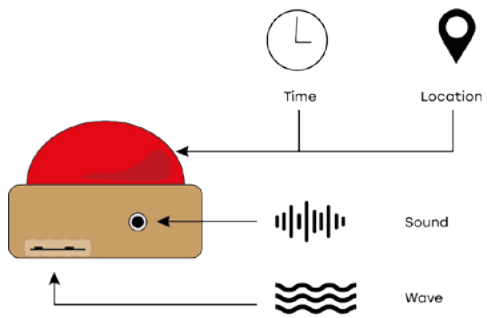
Hij drukt op de rode knop



Max geeft meer informatie over zijn ervaring van de overlast

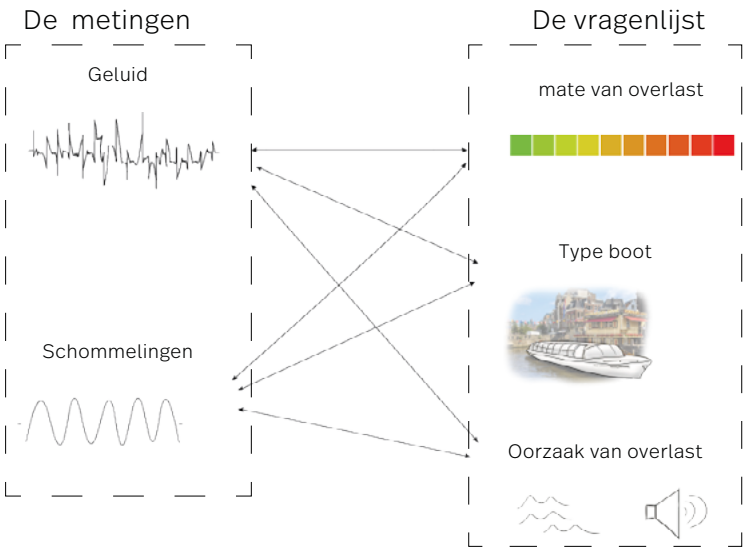


Verschillende woonbootbewoners hebben overlast gemeld



Op dat moment wordt het geluid en beweging voor 1 minuut gemeten. Ook het tijdstip en de locatie worden vastgelegd.

Max ontvangt een melding op zijn mobiel om zijn ervaring van overlast te delen



Onderzoekers bekijken de resultaten. Ze analyseren het verband tussen resultaten van de metingen en de vragenlijst.

Toestemmings verklaring

Naam:

Geboortedatum:

Adres:

Voor uw deelname aan deze test heb ik uw toestemming nodig voor de volgende punten:

De 3-daagse test

1. Ik doe vrijwillig mee aan dit onderzoek.

2. Ik begrijp dat ik voor de deelname van het onderzoek aan mij de volgende dingen gevraagd worden om te doen:
- Het melden van overlast door op de rode knop te drukken en hiermee het geluid te meten.
- Het melden van overlast door de vragenlijst in te vullen

Evaluatie

3. Ik geef toestemming om mijn antwoorden, uitspraken of ideeën tijdens het evaluatiegesprek autoniem / anoniem te delen (omcirkel uw voorkeur)
4. Ik geef toestemming om mijn notities in het notitieboekje te delen

Geluid

5. Ik geef toestemming om de data van het geluid uit deze test te laten onderzoeken en te delen voor het afstudeerproject van Nina te Groen zoals gekozen op pagina 4.
6. Ik ben ervan bewust dat er ook metingen worden gedaan van het geluid wanneer ik niet op de knop druk.

Vragenlijst

7. Ik geef toestemming om mijn antwoorden in de vragenlijst te delen

Foto's en filmopnames

8. Ik geef toestemming om foto's en filmopnames van het prototype in mijn huis te delen
9. Ik geef toestemming voor het maken en delen van foto's en filmopnames waarin ik herkend kan worden

Gegevens

10. Ik geef toestemming voor het delen van mijn persoonlijke gegevens voor het onderzoek (naam, leeftijd, adres)

Ik ga akkoord met de volgende punten:

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ 6
☐ 7
☐ 8
☐ 9
☐ 10

Handtekening:

Datum: